CIO

THE MAGAZINE FOR INFORMATION EXECUTIVES

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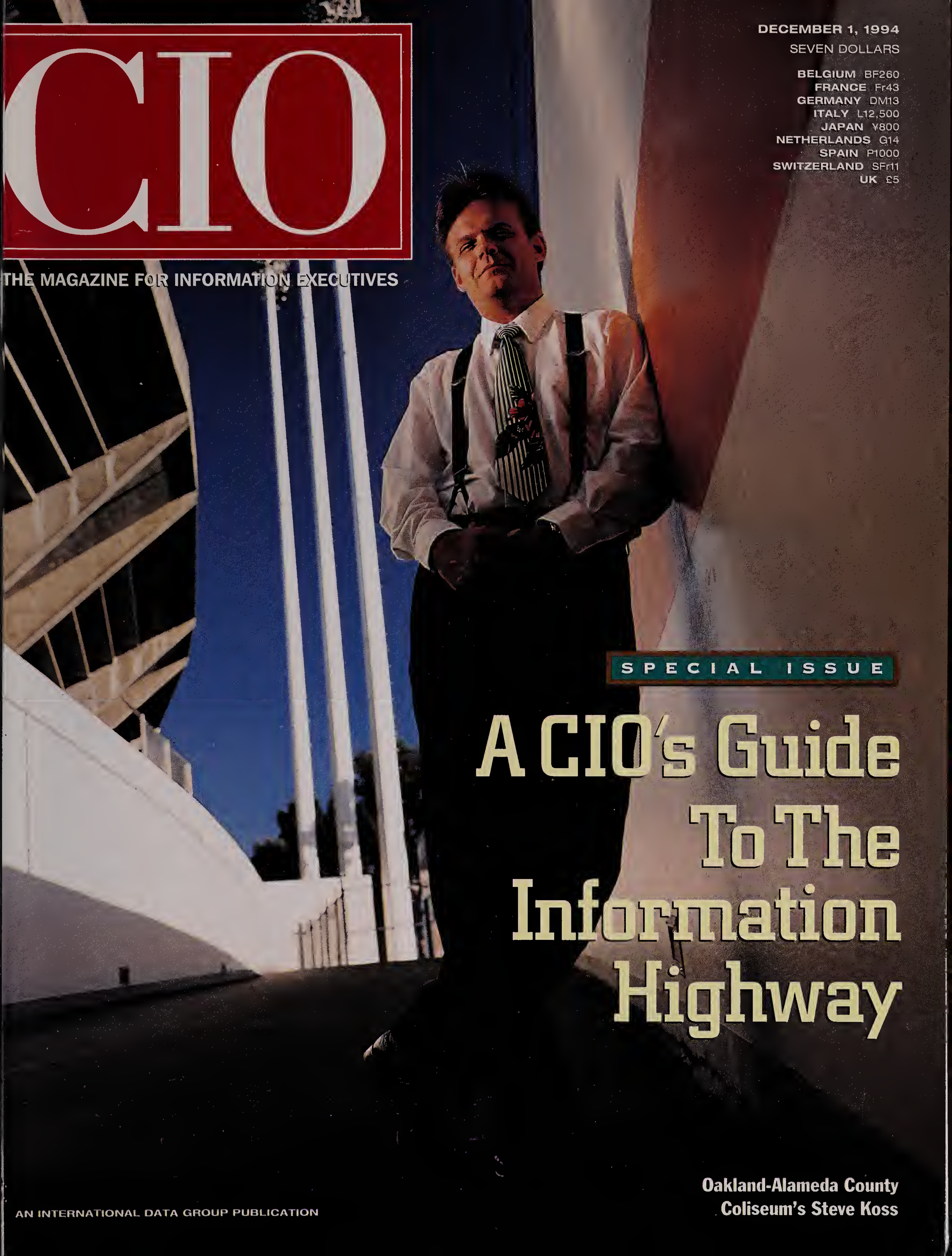

SPECIAL ISSUE

A CIO's Guide To The Information Highway

Oakland-Alameda County Coliseum's Steve Koss

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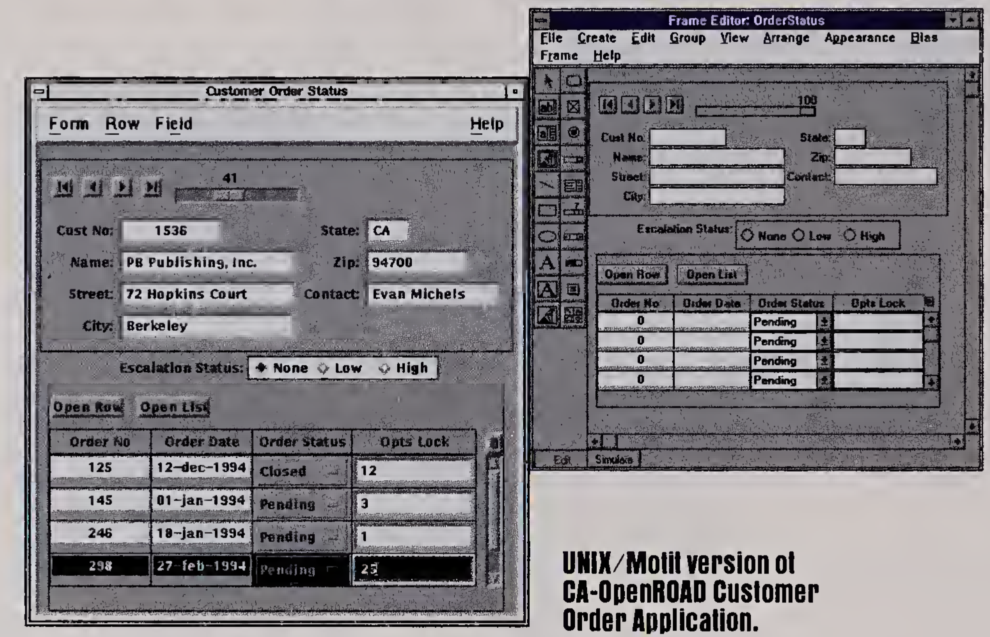
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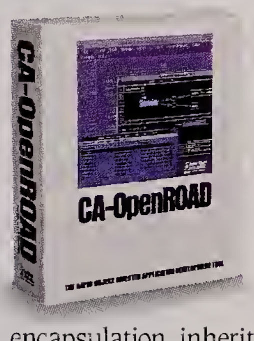

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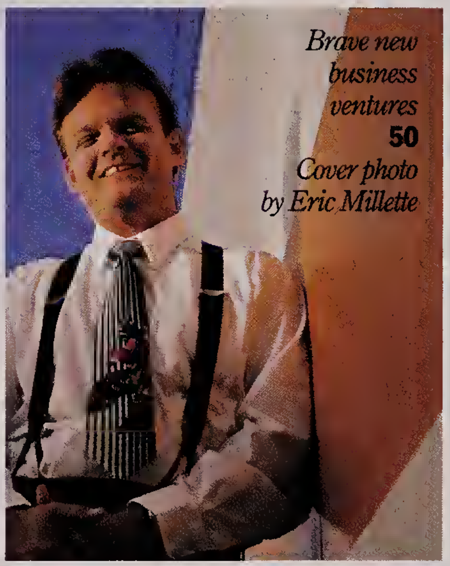

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Only abstinence offers complete protection from vandalism, viruses and other hazards of doing business on the Internet. But experts contend that the potential payoff of going online makes it worth confronting those fears. *By Anne Stuart*

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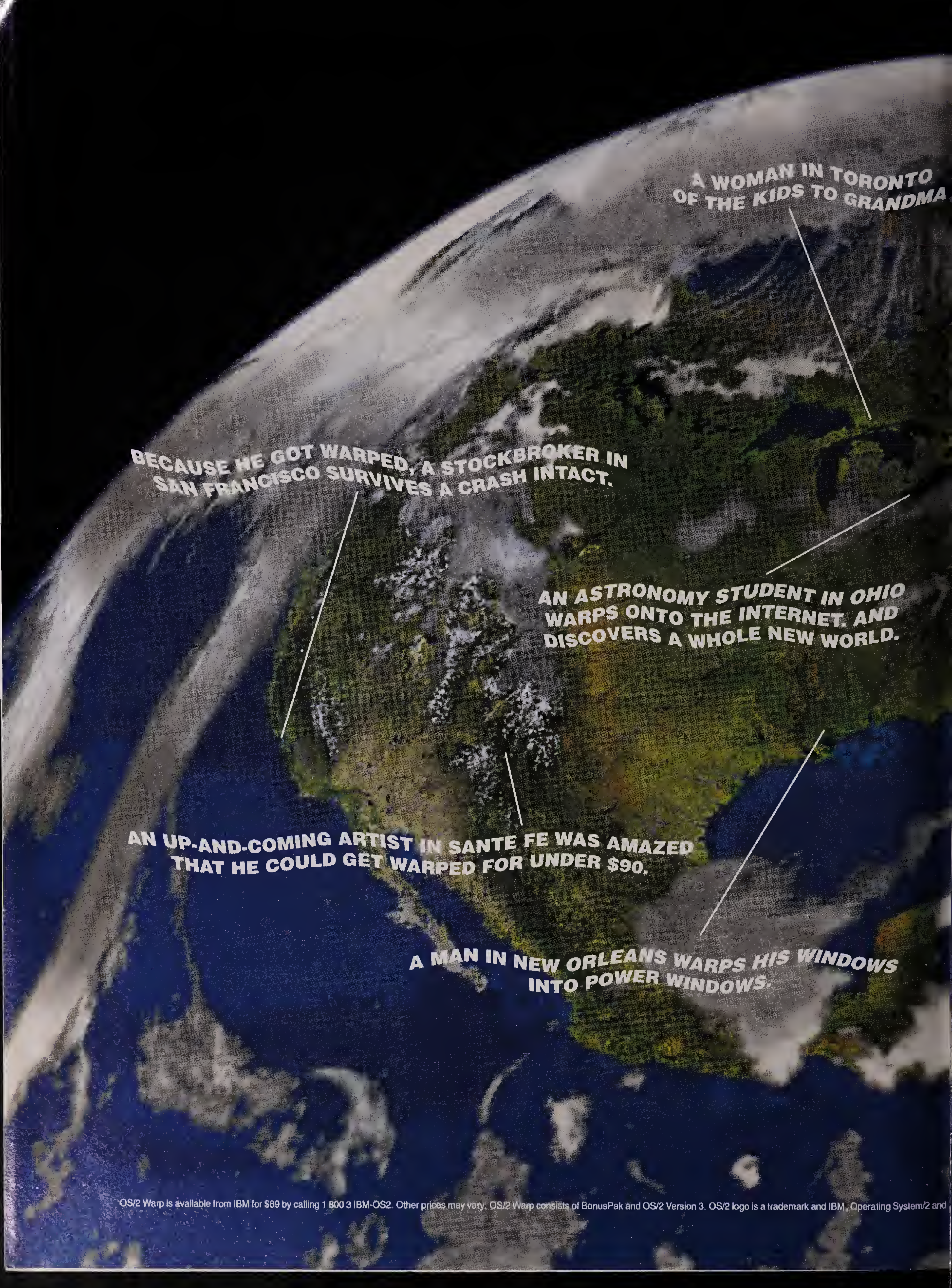
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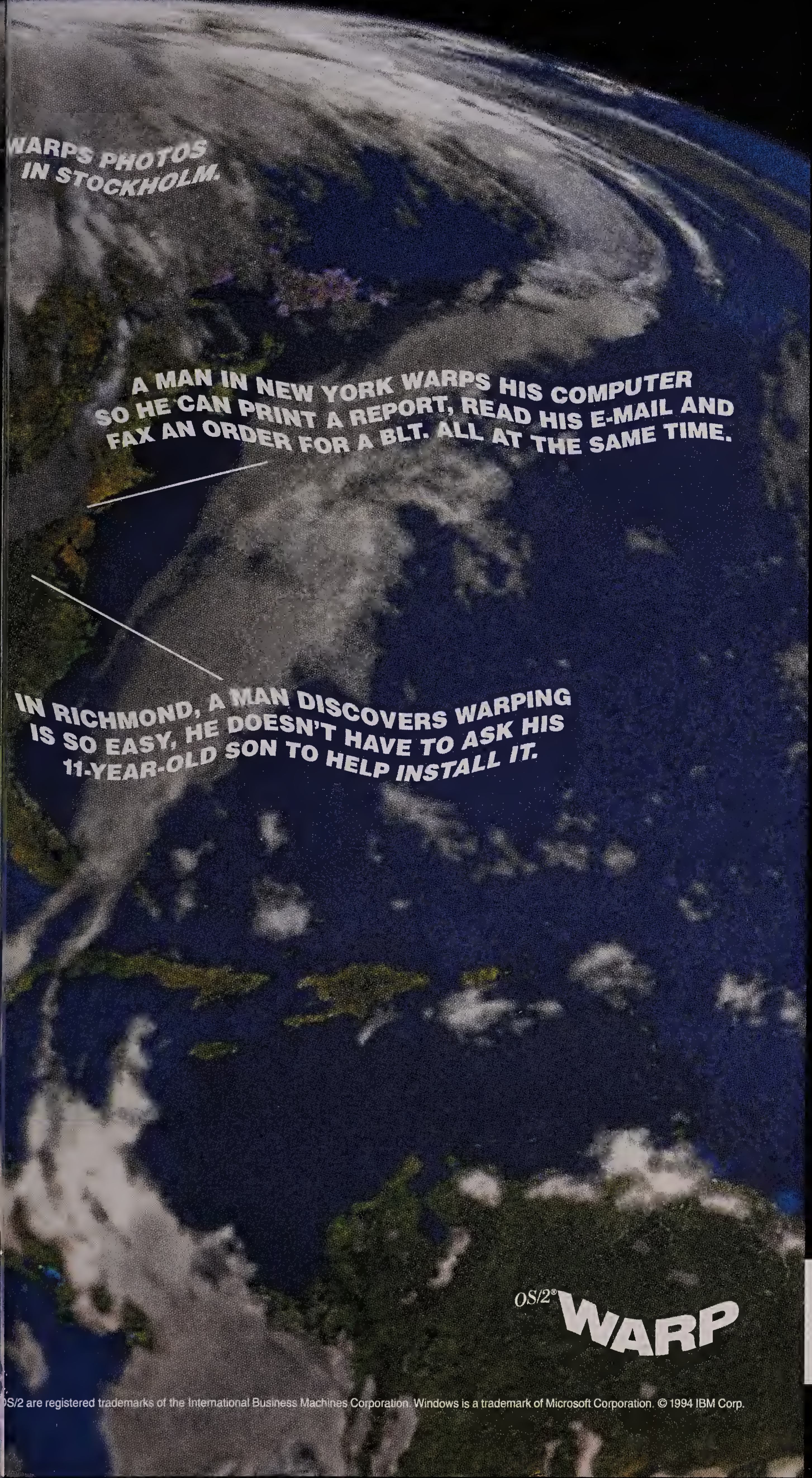
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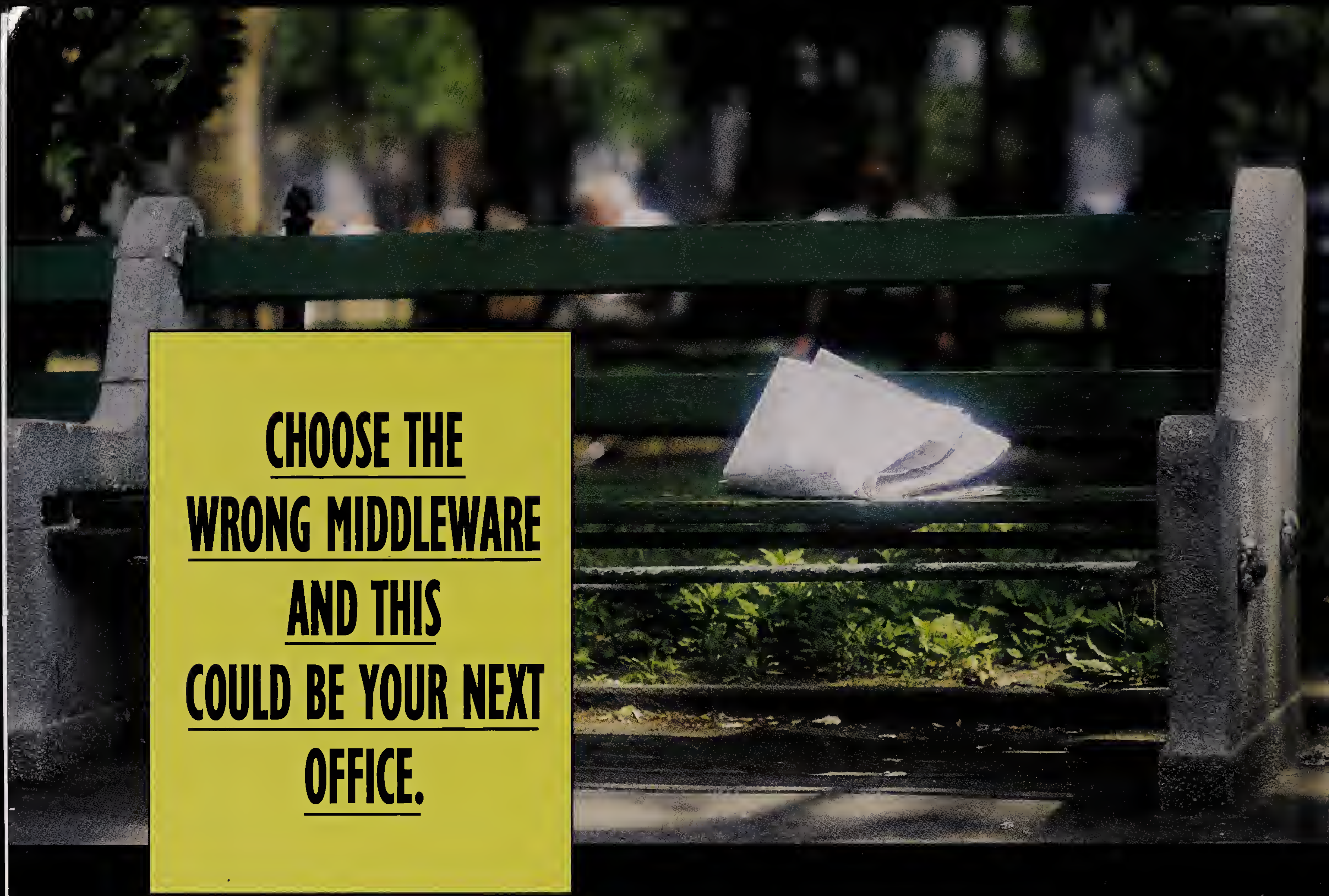

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The NII is likely to transform the ways in which companies create and deliver goods and services. Here's a look at what the future might bring.
By E.B. Baatz

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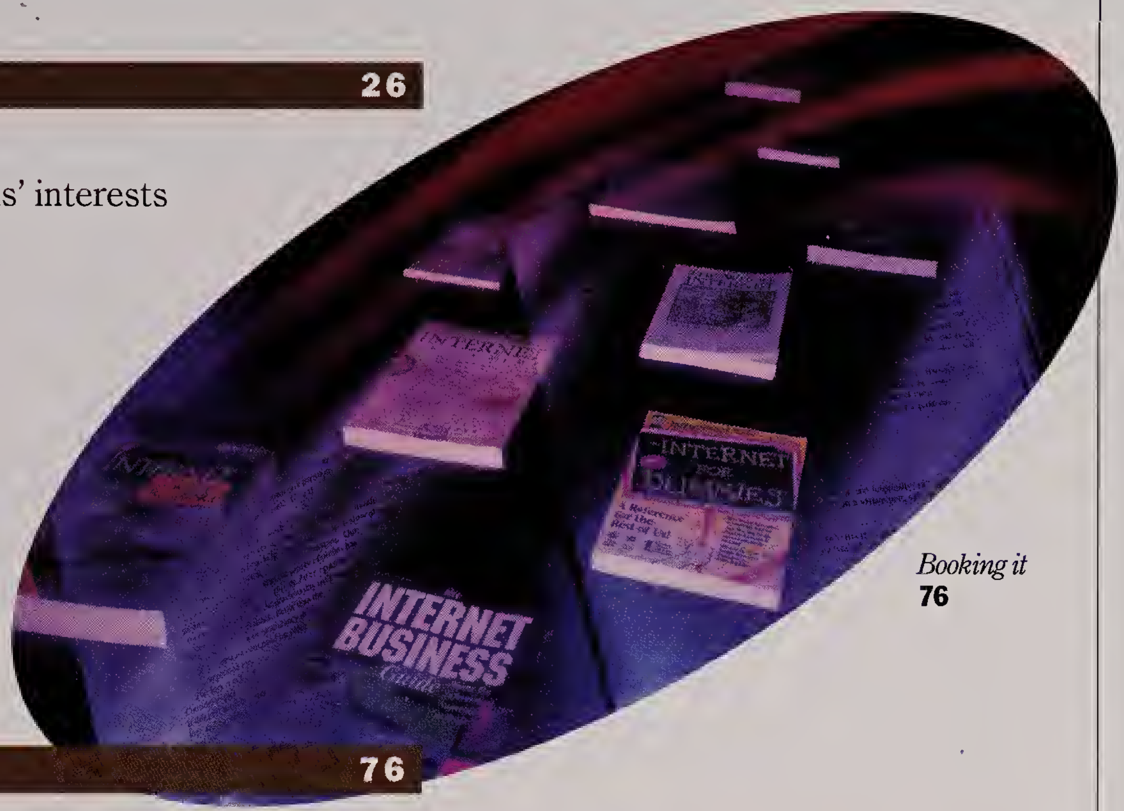

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Books about the Internet abound. Here's a guide to what should be on your bookshelf—and what to recommend to everyone else in your company.
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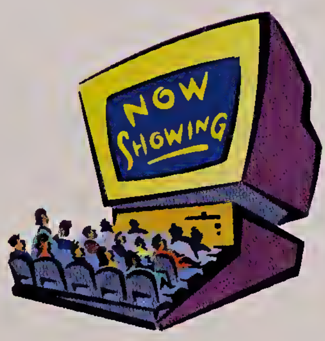
The pioneers of E-mail reflect on the journey from ARPANET to the Internet.
By Anne Stuart



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Daily news reports tell us that the National Information Infrastructure is poised to overtake our business and personal lives. At *CIO*, we've been following the story closely to see how much the information highway—which is known in its existing incarnation as the Internet—has made inroads into the minds and professional matters of information executives.

Led by Senior Editor Leigh Buchanan, the editorial team began planning an issue focused on the NII last summer. Senior Writer E.B. Baatz put together an informal questionnaire on information highway issues which we sent to 1,000 of our readers; within two weeks, 250 responded. Although almost half believe the NII will prove useful or critical to their organizations, less than 5 percent said their businesses are currently using the Internet. Clearly, the message is out that the information highway may open up substantial new business opportunities; what remains muddy is what those opportunities are and how CIOs can help their organizations exploit them.

Accordingly, we've viewed the topic many ways—from examining information executives' worst fears about bringing the Internet in-house to exploring how CIOs can learn about and champion the information highway in their enterprises. In addition, this issue includes an article on establishing an Internet presence and a guide to recommended Internet books. We also look at some future scenarios outlining how the NII could affect the banking, manufacturing, health-care and retailing industries.

As Buchanan explains it, this issue is not designed to cheerlead the creation of the NII, but rather to provide real-world examples of what the new and emerging technologies will mean for our readers. E-mail is only the most obvious application of the new connectivity: Some organizations already have more-innovative applications riding on the information highway. For example, Summa International makes its object-oriented software products available on the Net for comments and criticisms, and the Oakland-Alameda County Coliseum has used it to gather information while developing an economic impact model for arenas and convention centers. Many companies also are using the Net to do business with—and get the lowdown on—their IT vendors. And some have enlisted it to help them do business globally, an imperative for future competitiveness.

Today, many CIOs are wary of the information highway; they view it as a lot of hype. But as one forward-looking executive contends, in an uncertain, ever-changing environment, one ought to plant electronic seeds liberally. CIOs should try a great many different things; some will work, most will not.

Marcia Blumenthal

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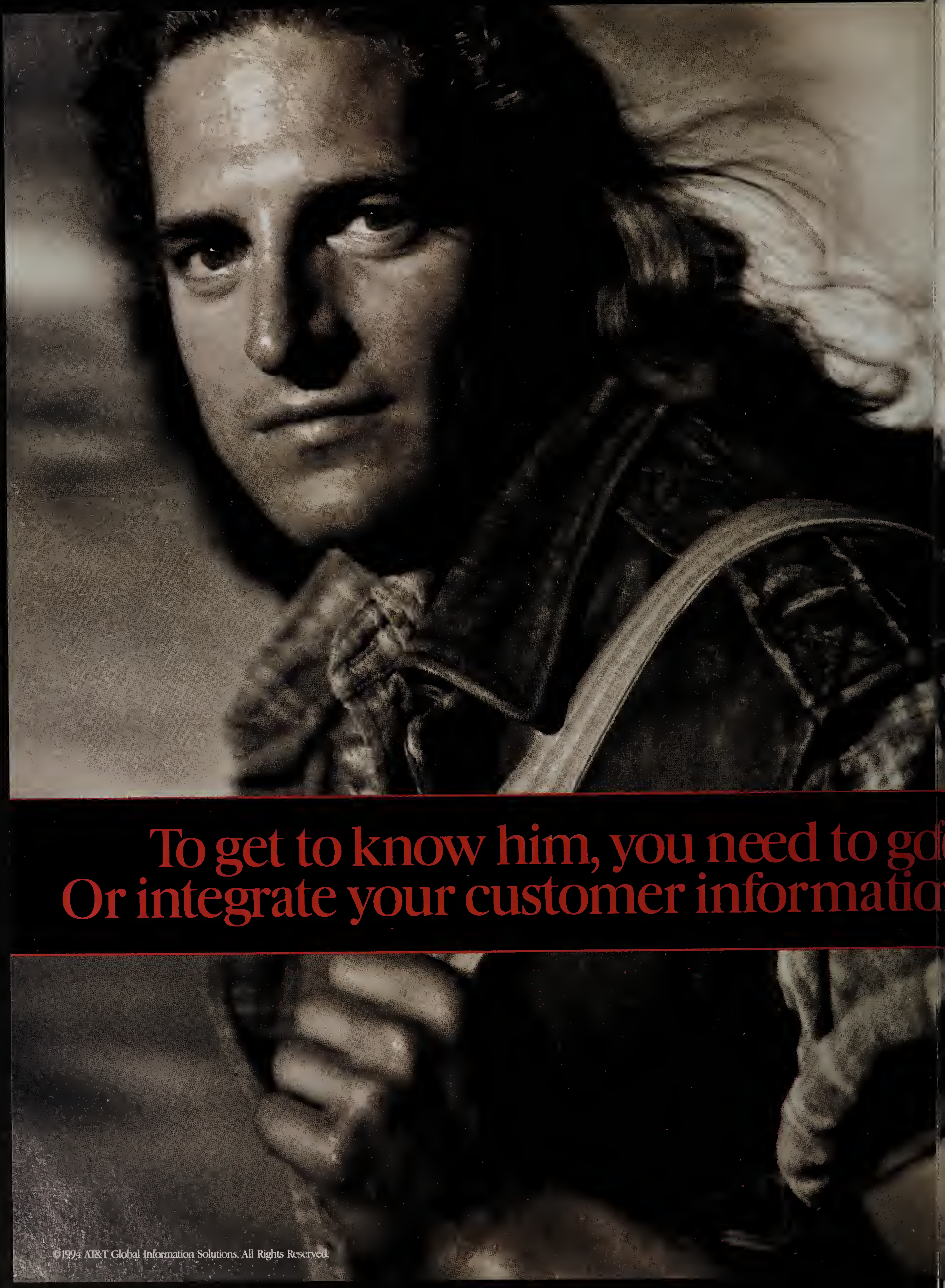
Information Technology and the Bottom Line

A decade ago, critics questioned the return on investment from information technology. But times have changed. New IT metrics confirm the power of information technology to help companies attain business objectives and profit goals. From a look at how IT enables reengineering and global expansion to an update on the client/server architecture and stand-out technologies such as electronic data interchange, this special section examines the growth of the IT industry and its impact on the bottom line.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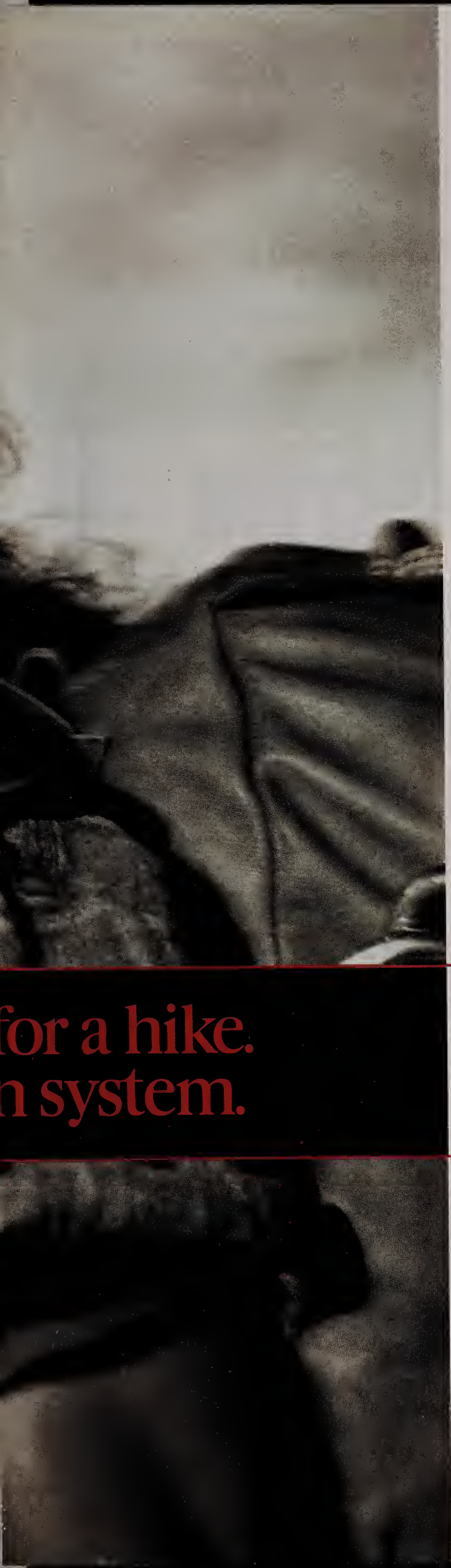
for a hike.
n system.

"The phrase 'getting close to the customer' now has a definite high-tech ring," says an article in the *Harvard Business Review.*

"Farsighted companies..." it continues, "have gained a decisive competitive edge by building powerful customer information systems."

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Jim Bessen, "Riding the Marketing Information Wave" *Harvard Business Review* September-October 1993

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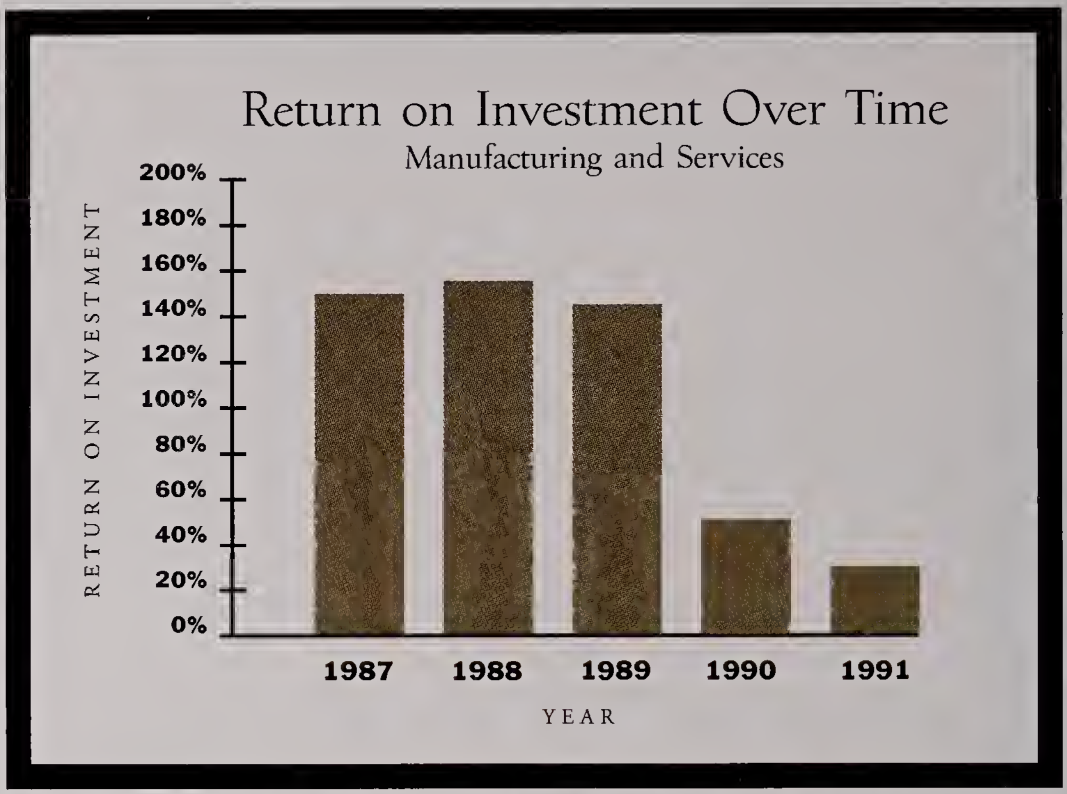

A January 1994 study, "New Evidence on the Returns of Information Systems," by Erik Brynjolfsson and Lorin Hitt of MIT's Sloan School of Management, found measurable rates of return on investment from technology spending, thereby debunking the so-called "productivity paradox." Technology investments made in 1987, as shown above, show a consistent rate of return for the first three years after their inception, then drop the next two years.

IN THE BRUTAL, bemusing arena of interoffice politics, even the sternest of managers must occasionally pity the plight of the chief information officer. While the CFO and other officers can campaign on their service records year after year without ever changing a plank in their platforms (the bottom line, after all, is the bottom line), the poor CIO is forever trying to please a fickle electorate of special-interest groups. One year the election theme is enterprise computing, the next, interactive help desks. Or systems downsizing. Or empowered workteams.

CIOs and CFOs have long found themselves at odds over information technology (IT) spending, but in fact, they're more often than not on the same side, just speaking in different languages. Now, several developments may foster a new dialogue between finance and technology. Recent studies have debunked the bewildering "productivity paradox" of the last decade—when it couldn't be reliably proven that technology spending improved performance—providing new and more relevant benchmarks that prove a direct correlation between IT deployment and productivity increases. And a handful of new measurement techniques that blend traditional return on investment (ROI) metrics with "soft" benefit measures are helping CFOs and CIOs track costs, assess benefits and agree on spending initiatives.

It's difficult to measure competitive advantage, but most managers would agree that three main factors contribute to it: productivity, which emphasizes internal resources; service, which caters to the all-important customer; and flexibility, which enables organizations to accommodate capricious markets. CIOs are only too happy to detail the myriad ways IT can boost margins in all three sectors.

When it's expertly and judiciously applied, information technology can speed customer service, slash turnaround times, simplify order entry and shipping, discover and deliver new products to market, improve customer satisfaction, boost user friendliness, increase data accuracy and foster information exchange among departments. Organizations use IT to determine which lines of business are

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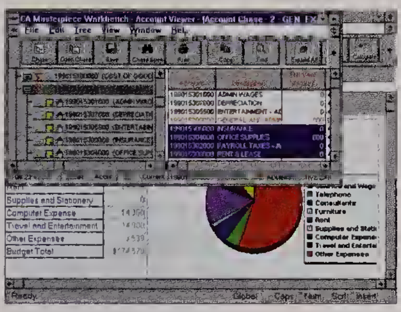

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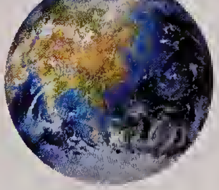

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unprofitable and which business processes are inefficient, and they leverage technology to identify new markets. Finally, IT distributed throughout a company increases efficiency by delivering information where and when it's needed.

A New Yardstick

WONDERFUL, SAY SKEPTICS, but how can we tell if any of these systems are working? The answer is, you can...and you can't.

Traditional ROI, which has its roots in the manufacturing era, stipulates that an investment's worth is directly related to how much it can save in labor or materials costs. By definition, ROI doesn't accommodate what companies are hoping to achieve with information technology: improved business processes, market and customer-service support, and competitiveness.

To analyze IT expenditures and outcomes, companies are turning to a new subscience, information economics. By using weights to prioritize the intangible benefits of IT projects, managers can measure them alongside dollar figures of ROI. After laying out corporate objectives and categories of risk and assigning weights to both, proposed projects are scored based on how well they'll reach objectives and on what level of risk they carry. Then a peer-review committee analyzes each proposal to screen for oversights or exaggerations. And finally, companies follow up to determine whether benefits really occurred.

Not only does information economics help close the gap between financial professionals and information executives, it can have a positive influence on corporate decision making overall. The system forces all parties to identify and agree upon corporate objectives, weights, scores and results, in effect signing off on each project before it goes forward. And that's an intangible benefit that nearly any corporate management team would vote for unanimously.

The IT Revolution

WHEN HISTORIANS LOOK back and try to recapture the mood of the 1990s, they'll no doubt refer to the decade's first presidential election, when Republicans talked about family values and Democrats talked about the economy. Business watchers already have a jump on things: They know that values *and* economics are the hallmarks of corporate America in the '90s. But the "values" corporations are after aren't family-based, they're customer-based.

When reengineering, companies should view information technology as a tool to enable change, not as the reason for the change.

Today's customers want better products and services, delivered sooner, and tailored more specifically to their exact and ever-changing business needs. Organizations, whether they offer services or products, now realize that customer service is one of the few ways they can maintain and increase market share, particularly after they've done all the belt-tightening possible. If customers are the ticket to the bottom line, then information technology (IT) can be used to identify, anticipate and cater to their needs and wants.

As organizations determine that they're not equipped to deliver what their customers demand, they turn inward to reevaluate the way they do business. That process, known by the now nearly ubiquitous industry buzzword, reengineering, is at many companies followed by a shift from proprietary, host-based computing systems to an open, flexible client/server configuration. That shift allows managers to more easily deliver information to employees who deal directly with customers.

Some companies push the client/server technology several steps further to become that most modern of businesses: a global entity that can deliver its services anywhere on earth as easily as if it were next door. Without yet reaching the halfway point of the 1990s, it's already clear to business soothsayers that these three tenets—reengineering, client/server computing and globalization—will form the cornerstone of business profit and loss for the remainder of the decade.

Reengineering

THE TERM "REENGINEERING" has become a synonym for any kind of change, preferably one that promises to make the corporation more money. For many CFOs, reengineering means someone is asking them to spend lots and lots of money on completely new computer systems.

In fact, business-process reengineering involves radically restructuring a company's processes so that customers rather than operations are the focus of all business activity. Because rethinking business processes requires rethinking business policies themselves, analysts advise companies to view information technology as a tool to help enact change rather than the reason for the change.

Companies focus on process rather than on functional lines to ensure every employee is adding value and not simply routing or processing goods or information. "Reengineering means finding the cleanest, straightest line between raw materials [or services] and the customer," says Allan Frank, national partner in charge of enabling technologies at KPMG Peat Marwick in Radnor, Pa. This often means changing from a vertical structure, with individual departments reporting to higher-ups all the way to the top of the company, to a horizontal configuration, where the flow of information, goods or services takes precedence.

The shift is usually achieved with new, often open, networked computer systems that allow workers to share and route information across departments. Frank suggests four ways IT can assist once managers have identified their business-process-reengineering goals:

- provide anybody-to-anybody communications
- offer access to shared information
- allow the firm to locate functions where needed in the organization
- let workers capture information at its source.

Reaping Reengineering's Rewards

WHAT DO SUCH LOFTY business and systems goals provide to corporations? Plenty, say reengineering advocates, if carried out properly. Since even Michael Hammer, co-author of *Reengineering the Corporation*, has conceded that nearly two-thirds of all reengineering efforts fail, full and unequivocal top-management support of reengineering and clear communication among the CEO, CFO and CIO are essential. But if reengineering tenets are faithfully followed, corporations can reduce cycle time, shrink costs, increase the level of service they provide to their customers and, ultimately, boost their profit margins and overall profitability. Productivity is high on most managers' lists of reasons to reengineer; by ensuring that every employee is adding value as efficiently as possible to the overall business tasks, productivity can soar, translating into reduced costs and higher profits.

A successfully reengineered firm is faster and more flexible in responding to market initiatives and opportunities, leverages information more effectively and uses information technology to pinpoint specific markets. One long-distance phone company, for example, instituted a system that lets workers perform ad hoc analysis on the usage patterns of high-volume customers and then develop micro-targeted services to keep those customers in the fold. At U.S. Shoe, the apparel and footwear manufacturer, a reengineering effort that updated antiquated point-of-sale and merchandising systems gave the firm a much more timely and specific insight into what customers were buying—down to size and color—as well as which retailers needed more products and when.

Staying competitive in a changing business market requires balancing the need for increased customer service and value-added service against costs of payroll, inventory and other operations; both sides of the equation can improve with an IT-based reengineering effort. Rather than operating

A successful global company uses technology to function as a virtual organization that "sends" expertise and data where and when they are needed. The information travels; the people stay put.

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as separate fiefdoms, finance, manufacturing, marketing and inventory work with the same body of information. Sharing information not only speeds the process, it improves accuracy by reducing or altogether eliminating the number of times data must be rekeyed.

Reengineering often brings into existence interdisciplinary teams that allow a corporation to have several areas of expertise concentrating on the same problem at once. Such hybrid teams can provide checks and balances that keep workers focused on overall business goals rather than on the goals of their individual departments.

The Client/Server Computing Architecture

AT MANY COMPANIES, reengineering has come to mean the shedding or sidelining of expensive, rigid mainframe programs for client/server's less expensive, highly flexible computing platform. A 1993 survey of more than 400 CIOs, conducted by Deloitte & Touche's Information Technology Consulting Group, found that a mere 27 percent of respondents' critical applications were running on client/server systems, but a whopping 93 percent of respondents expected this figure to double in their corporations by 1995. Similarly, nearly half of the 224 CIOs surveyed by CSC Index Inc. listed client/server as the most important emerging technology for 1993.

A simple description of the client/server architecture—a computer network in which client PCs or workstations running user-interface and other software are able to request services from a server that maintains databases, processes requests and ensures data integrity—doesn't begin to explain its nearly explosive impact on corporate information systems.

Because client/server systems require much smaller and less expensive machines—personal computers or workstations rather than terminals, and a local area network (LAN) file server rather than a mainframe (although mainframes can act in this capacity)—cost per MIPS is cheaper, maintenance is easier and hardware and software upgrade costs are lower. In addition, client/server is an open system, so companies freed from the constraints of the one-computer/one-vendor syndrome can shop for the best price from among several retailers, expand their systems as they wish and rest (relatively) assured they'll be able to accommodate future changes in standards.

Client/server adds value to decision making and supports the type of a search that would require $2,000 worth of programming for a mainframe query, KPMG's Frank explains. "Plus, there's the functional capability—every human being has his whole computer to himself. This greatly expands the things that person is able to do."

Client/server provides the speed, flexibility and improved communications workers need to beef up customer contact functions.

The concept of the worker empowered by client/server's distributed information lies at the heart of the architecture's appeal. Networked systems increase access to information by bringing processing and data where they're needed in the organization instead of making workers petition the mainframe. Client/server provides the speed, flexibility and improved communications workers need to beef up customer-contact functions. By distributing information and giving users relational databases and other tools to get at it, companies are often able to realize a relatively quick return on their client/server investment once end users, rather than a team of programmers, begin querying, modeling and forecasting with corporate data. In addition, internal communications such as project-related exchanges among a group of workers increase dramatically with distributed systems.

Despite the architecture's relative immaturity, its future looks bright. On the horizon are new applications and application-development tools that can support very large implementations, as opposed to the small pilot projects that have dominated corporate client/server thus far. Application innovation is also expected to broaden significantly as software becomes able to efficiently handle a wide range of data types, including free-form text, audio, video and so on.

With such bright, shiny credentials, why isn't every application a client/server application, and why isn't every IS manager singing its praises? Cost is a big factor, and complexity is another. While analysts and CIOs generally agree with the industry assertion that client/server computing is less expensive than mainframe computing, the price tag for switching from one system to the other can be enormous—enough so that client/server's break-even point can be many years away for some companies. And the relative youth of the market means standards haven't jelled yet, software isn't bug-free and vendors aren't always 100 percent accurate with their information.

"The technology is relatively immature, and that's a big, big concern," says John Halloran, managing partner at Nolan, Norton & Co., a Boston-based IT consulting firm. "Companies are being overhyped and underdelivered by the vendors, and IT is left to sort out the issues within the organization." Often this situation results in cost overruns, sometimes of dramatic and unexpected proportions. A recent survey of Nolan, Norton clients revealed that 53 percent of respondents found the cost of client/server was greater than they had expected. In toting up client/server costs, novices often forget to budget for such items as wiring, routers, consultants, middleware and retraining for employees, which can sometimes cost as much as

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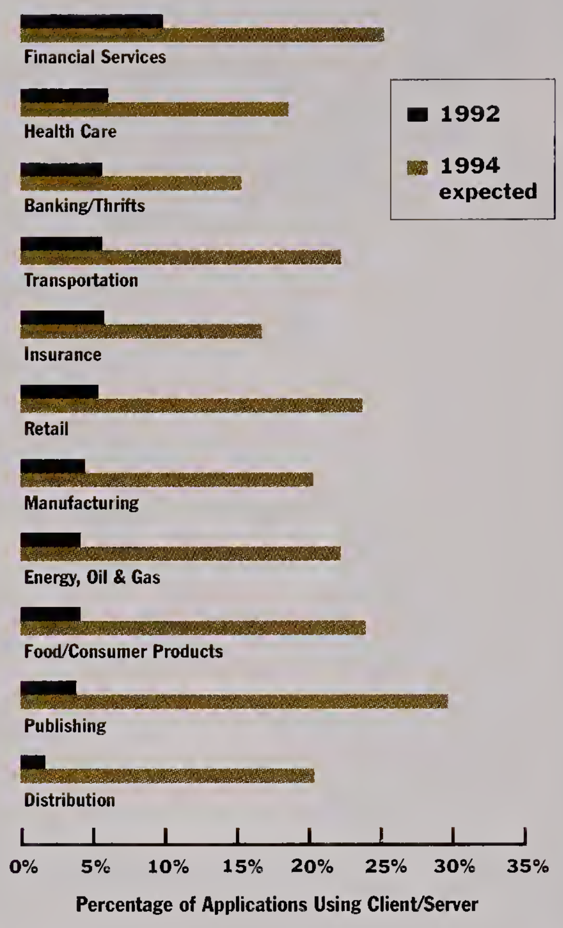
Client/Server Usage

Companies in all industries expected to dramatically increase the number of client/server applications in use this year



Source: Deloitte & Touche, 1993

or more than all the hardware and software combined.

"If your CIO tells you that rearchitecting all your systems to client/server will save money, be skeptical. Everything I've seen suggests that the total costs of client/server computing—hardware, software, conversion of existing systems, development of new systems, training, management—will be higher than the costs of mainframe computing," says Charles B. Wang, founder and CEO of Computer Associates International Inc., in his book, *Techno Vision.*

One way to avoid or at least minimize problems is to plan carefully and implement slowly, experts and vendors advise. The biggest mistake is rushing to migrate applications before articulating the anticipated payback and determining the costs involved.

In deciding which systems to move from a legacy system to a client/server environment, managers should identify which systems represent the highest business value and are most in need of client/server's distributed benefits. CIOs should provide and CFOs should demand to see demonstrable added value. For example, IS managers at Sprint Corp.'s Long Distance Division argued—correctly, it turned out—that a move to a client/server system for billing procedures would allow customer-service agents to answer inquiries or check the status of large accounts in 45 seconds instead of the 24 hours required to print and analyze information from a legacy system.

Client/server vendors and consultants advise companies to start with a few applications to get their feet wet, then select two or three strategic but low-risk candidates for pilot projects. Finally, organizations should develop a two-year transition plan during which they migrate applications 10 or 20 at a time. To minimize programming costs, experts advise companies to reuse whatever code they can, particularly if the business-specific logic code from the legacy system was sound in the first place.

The Global Corporation

ONCE A COMPANY has reengineered its business processes for maximum efficiency, most often by moving to a flexible client/server network, it's primed to start competing head-on in the much-touted global economy of the 1990s. Being truly global rather than merely international means an organization's worldwide business units are integrated enough to achieve strategic alignment that delivers significant returns in economies of scale and scope.

Information technology takes front and center stage in this push for global coordination. "The sheer volume of times you need to communicate ratchets up multiple times," says Tobey Choate, vice president and managing director of IT at Arthur D. Little in Cambridge, Mass. "IT lets you speed up the rate of those interactions, harmonize them and shorten communications distances between remote employees." Information technology can function as a great equalizer, Choate says. "It lets you call an apple an apple around the world."

Companies consolidate their domestic and international data centers, for example, to dramatically reduce their communications costs. Digital Equipment Corp., which maintains what's widely viewed as the largest private network in the world, is said to have reduced total IT costs between 25 and 30 percent by consolidating a number of worldwide data centers.

On a broader level, successful global companies use technology to function as a virtual organization that "sends" expertise and data where and when they are needed. The information travels; the people stay put. Remote communications links allow companies to stay extremely flexible in changing markets by assembling ad hoc "teams" of workers and resources for particular projects without having to relocate anyone.

As trade barriers continue to fall and economies continue to converge, the same elements that made companies winners in their local markets will increasingly determine who can compete on the world stage. Analysts and managers agree that an IT-inspired advantage on the home front will serve as a launching pad for worldwide market dominance.

Tools You Can Use

FORCED INTO cold-shock therapy by the recession of the early 1990s, most chief information officers emerged as clean and sober team players who say their number-one priority is making sure information systems' objectives are closely aligned with the general business objectives of their organizations.

For CFOs, CEOs and other top-management executives, this new openness has provided a greater understanding of IT and broader access to the arsenal of tools CIOs have at their disposal. When asked how they can help increase company productivity, boost quality, lower the cost of doing business, improve customer service and reduce time to market, CIOs respond with a veritable Chinese menu of technology-driven options, from network management and workflow applications to decision-support systems, wireless communications and computer-aided software engineering (CASE) tools.

Of this dizzying array of both established and emerging technologies, a handful stand out as repeat winners that go the furthest toward identifying redundancies and reducing inefficiencies. If IS professionals were forced to build a political platform on just four planks, many would choose electronic data interchange (EDI), imaging, outsourcing and revamped legacy systems (yes, legacy systems) as mature, manageable technologies that can be applied to improve the corporate bottom line.

Electronic Data Interchange

IN ITS MOST SIMPLE configuration, EDI is a set of standards and practices that allows organizations to exchange business documents over an electronic network, reducing or altogether eliminating such business-transaction paperwork as invoices, purchase orders, confirmations and shipping notices. Firms exchange documents over a private network, most often running the X.12 protocol specifically developed for EDI, or through an EDI service provider.

Recently EDI technology has evolved so that two issues that initially struck fear in the hearts of CIOs—compatibility and standardization—have largely been resolved. Most proponents say the high cost of implementing an EDI system has eased, particularly since some systems quickly pay for themselves in savings on facsimile transmissions, telephone calls and paper mail alone. EDI has become an accepted way to transact business, as all types of industries use the technology to speed everyday transactions with business partners, reduce workloads, increase efficiency and improve archiving.

Utilities, some of the pioneers of EDI, use it to electronically bill and receive payments from their largest customers. Consortiums of competitors have sprung up in several industries to improve business overall by giving buyers a standardized, industry-wide way to place orders. A group of seven major competing ocean shippers, for example, has agreed on a single EDI formula for customer use; competing hospital suppliers have installed an EDI system that allows hospitals to directly place orders for next-day shipment; and in Europe, electrical appliance firms have settled on a standard EDI form for product service and repairs.

EDI packs its biggest punch when combined with other technologies, particularly electronic mail, business applications, workflow software and even the Internet. Combining EDI and workflow technology, for instance, facilitates the automation of not only the business transaction itself but also the internal steps surrounding order processing—approval, acknowledgment, manufacturing and shipping. Workflow/EDI systems, either homegrown or purchased off the shelf, can automatically complete and compile orders, then route and archive them as needed. The results are greatly increased productivity, reduced delays and error elimination.

Many EDI partisans say the "ultimate" application may do away with documents altogether. Some vanguard businesses have opened their networks to one another and are exchanging data without any forms or documents at all. Ford Motor Co. lets some of its auto-parts suppliers dial into its network, download data on production volume and parts demands, determine how many and what types of parts Ford needs and when, and ship them—all without action from the auto maker itself. In essence, Ford has shifted responsibility for supplies to the suppliers.

Ideally, outsourcers should function in partnership with the IS department. This is much more likely to occur if the outsourcer is given incentives for cutting costs and promulgating the business relationship.

Imaging

LIKE EDI, imaging technology aims to reduce the mountains of paper in most corporate offices. By definition, imaging is the process of creating an electronic image of a picture or paper document by scanning the item into a computer. In practice, organizations view imaging as a way to eliminate logging, routing, auditing, data-entry and monitoring functions while increasing accuracy.

Imaging systems let firms abolish physical paper-routing and filing functions and the delays they cause. Once-sequential tasks can occur simultaneously because more than one worker can access the same document at the same time, a physical impossibility with paper. As a rule of thumb, consultants and experts say any company that processes more than 1,000 document requests daily will probably benefit from an imaging system.

Imaging has taken awhile to catch on, partially because of its somewhat lengthy list of system requirements. To be readily accessible, images must be stored in an active medium in an uncompressed format, which requires a great deal of storage (usually on a networked optical or CD-ROM drive) and a fast processor for acceptable retrieval speeds. Translating the paper document into an image requires a scanner and viewing the electronic image requires a high-resolution monitor. Most experts also recommend a laser printer, an image index, database software and either a network server or a dedicated image server.

However, equipment costs are coming down so much that some items are considered commodities, and storage capacities are rising. And although companies tend to start out using imaging in its simplest form, as a kind of digital filing cabinet for accessing and archiving documents, market watchers say the real value comes when organizations begin to "push" the technology. A basic archiving and retrieval imaging system can offer a productivity gain of 5 to 20 percent, analysts estimate, but a strategic system built around but not limited to imaging can net gains of 40 to 50 percent.

Farsighted companies are combining basic imaging systems with business applications, such as order-entry and financial systems, or with workflow techniques to enact business-process improvements. Companies can use workflow software or an imaging/workflow hybrid package, for example, to improve their accounts-payable or other multistep, paper-based processes. Other imaging features include automatically generated audit trails, automatic sorting of incoming documents, automatic omission checking and paper-clipping capability, which "attaches" supporting documents to the image document.

When the FDIC auctioned off large portfolios of nonperforming loans last year, the agency used imaging—and paper clipping—to organize the sale of more than 3,100 loans. All information, including collateral documents, property notes, deeds and legal proceedings, was scanned into an imaging system and stored in a central file-review site in Des Plaines, Ill., where investors could browse through the portfolios by accessing the CD-ROM-based images from PCs. By eliminating the possibility of lost or misplaced documents, which could jeopardize a loan sale, and allowing investors to view all loans from one site, the FDIC increased sale rates on loan portfolios and significantly reduced overhead.

Outsourcing

OUTSOURCING—the practice of contracting with a third party to implement and manage a specific corporate department or function—is undergo-

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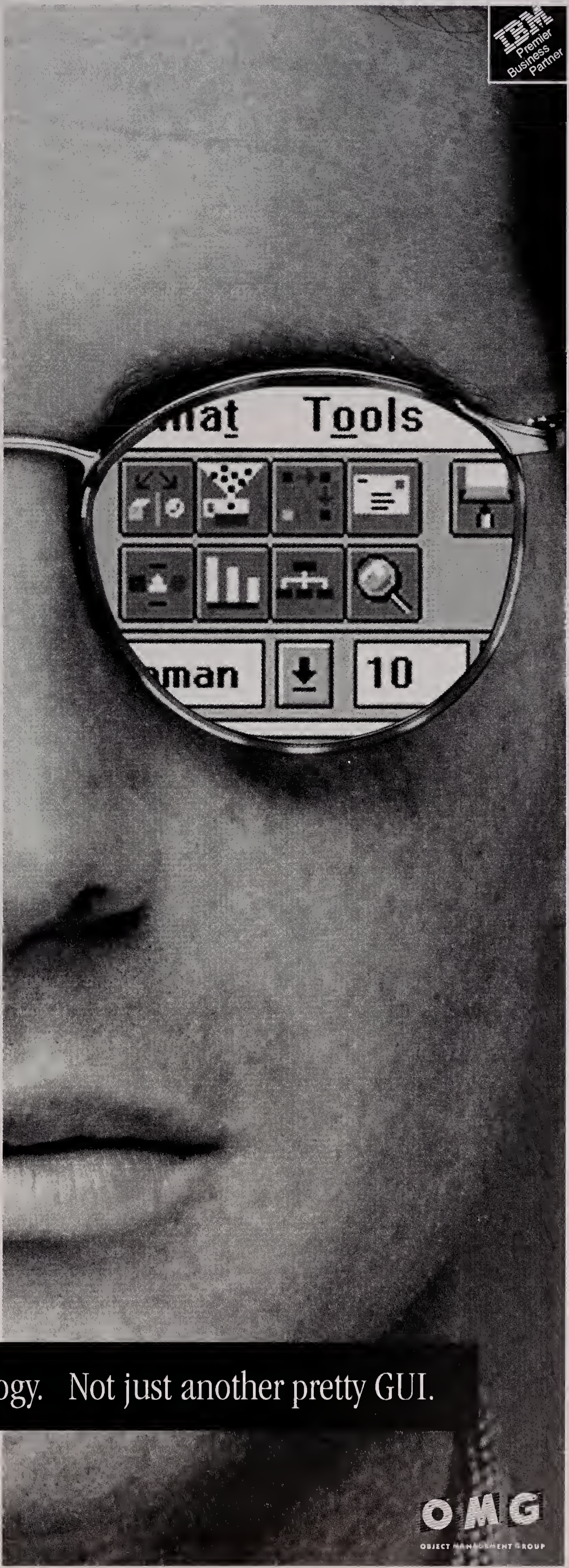


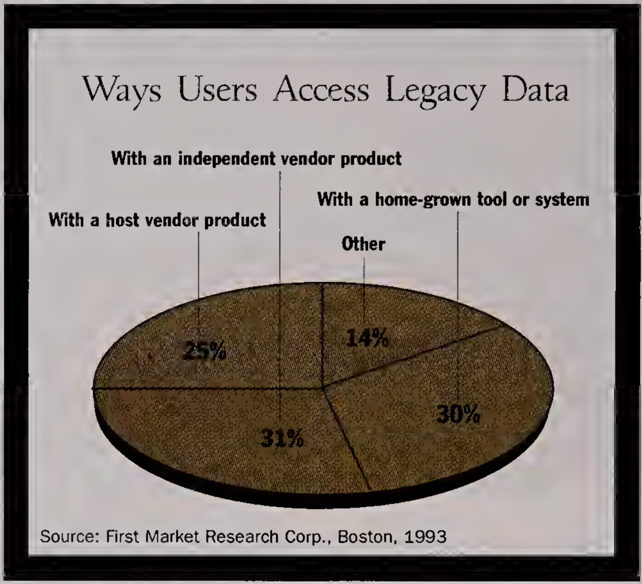
ing a renaissance in IT circles, thanks to a new breed of flexible contracts tailored to help with reengineering efforts and short-term requirements.

In its traditional and most extreme form, outsourcing involves contracting with a company to take complete control of an organization's information systems (IS) operations, including hardware, software, personnel and real estate. The setup allows companies to reduce operating costs, lower head count and rely on a fixed-fee cost structure. Such agreements are still used when a company feels it can't or shouldn't be trying to run a large-scale data center in addition to its core business. Outsourcing firms can sometimes bring fresh perspective or different areas of expertise to bear, streamlining an antiquated system as they go. Departments most frequently outsourced include data centers, voice networks and disaster-recovery systems.

While this approach is still relevant for some companies, particularly those that need large-scale, host-based data centers, it's being eclipsed by the strategic use of outsourcing for specific tasks for short periods. A typical contract runs for three years, but some companies are pushing for—and getting—contracts as short as one year, with renegotiation options as often as once a month. Most companies that opt for a shorter-term approach use outsourcing to free up their own development personnel to work on new, strategic systems, although sometimes a firm will hand off a new project to relieve the burden on overworked staff.

Transitional outsourcing contracts are designed to help companies manage the migration to new platforms, and companies often outsource host systems that will eventually be replaced by a new system under development in-house. Outsourcers have also responded to the changing marketplace by offering such services as consulting, performance tuning, network maintenance, help-desk operation, systems integration and development, and specific application support. Finally, selective outsourcing allows companies to manage far-flung network outposts in other regions or countries.

In the best relationships, outsourcers function in partnership with the IS department, a situation industry watchers say is much more likely to occur if the outsourcer is given incentives for cutting costs and promulgating the business relationship. One way to foster such a relationship is to tie the outsourcer's fee to the company's profits.



Source: First Market Research Corp., Boston, 1993

Legacy Systems Reconsidered

IN LIGHT OF THE FRENZIED activity in the reengineering and client/server camps, it's odd to see mention of legacy systems in anything other than purely negative terms. But mainframe and host-based systems are still very much part of the corporate-computing scene—and, analysts concede, some will remain so for some time to come. A 1993 Deloitte & Touche survey of 400 CIOs, for example, found that some 27 percent of respondents' critical applications ran on client/server, as compared with 69 percent that still resided on mainframes.

Analysts and CIOs alike insist there is no need to move adequately performing mainframe systems to another platform immediately, and in many cases, there are compelling reasons to leave some applications on the mainframe permanently. Security and transaction processing, two of client/server's weak points, are the most common reasons for leaving mainframe applications where they are. Programs like financials and human resources, and those that are mission-critical or encompass thousands of users, are often the last to move to client/server, if they go at all.

Even applications that will eventually be moved can be left where they are if they're performing well. This allows companies to concentrate on identifying and migrating strategic, must-move functions (see "The IT Revolution"). When the transition does come for the less critical applications, a planned, measured pace incurs fewer costs and upsets fewer people and functions.

Other applications can be retooled without much effort to respond more directly to a company's changing needs—by putting a user-friendly graphical user interface (GUI) client/server front end on them, for example. A wide range of products known as "middleware" provides myriad ways to get data from legacy to distributed systems. Middleware, which comprises communications, program access, data access, gateways and other client/server-to-old-iron workaround tools, translates user requests into material the mainframe database can understand and the client application can use.

Hybrid host-client/server applications are an option for many companies without the budget or need to replace their legacy systems completely. A Unix-based front end, for example, can provide real-time ad hoc access to legacy data that would otherwise be inaccessible to end users. The host data simply becomes the back end of the system. As an open operating system, Unix can pave the way for client/server, and many pro-

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gram vendors, including Dun & Bradstreet Software, market Unix versions of standard mainframe software.

Finally, CIOs and CFOs alike should be tough when considering which applications to move and which to keep on a legacy system. Veteran budget-conscious CIOs point out that one reason to stay with a mainframe system, ironically, is cost. While it may be cheaper per MIPS to run in client/server, it's often cheaper by far to stay with a system, such as payroll, that's working well and doesn't cry out for the distributed benefits of client/server. CIOs are able to spend their precious budget dollars on more high-profile and strategic applications, all the while keeping a cautious eye cocked to their legacy performers.

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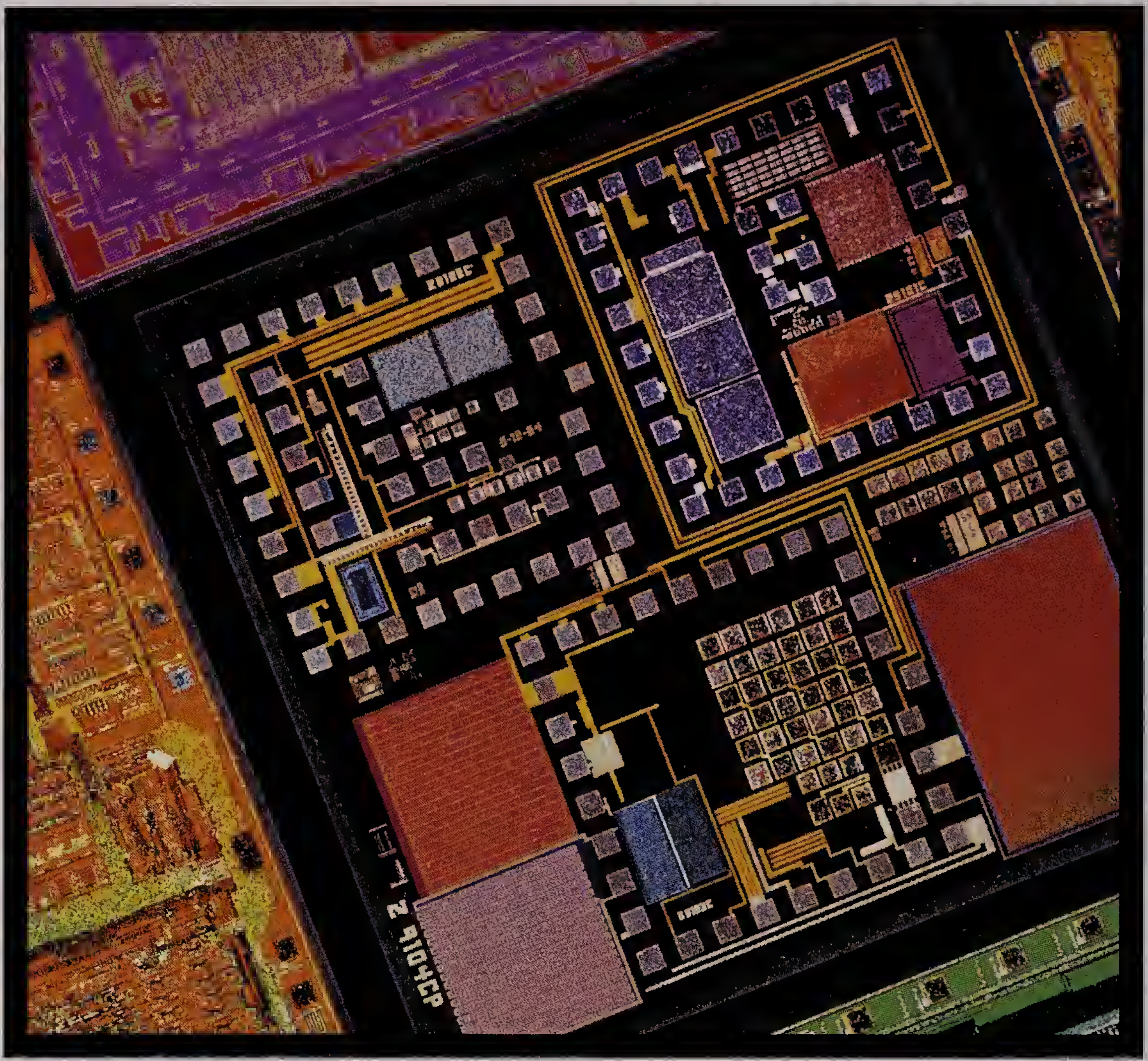

Glossary

Client/server computing—an architecture in which the client (personal computer or workstation) requests information or services from the server (LAN file server, midrange system or mainframe).

Document management—the process of electronically tracking and storing documents that have been scanned into a computer system or created via a computer application; often an integral part of document imaging.

Electronic data interchange—electronic exchange of transaction documents among organizations, including orders, confirmations and invoices.

Groupware—LAN software that allows networked users to participate as a team in joint, often complex projects.

Imaging—the process of creating a film or electronic image of any picture or paper form.

Local area network (LAN)—a group of computers and other devices dispersed over a relatively limited area and connected by a communications link that enables any device to interact with any other on the network.

Open systems—computer hardware or software that can accept add-ons produced by third-party suppliers; hardware and software that complies to a widely accepted nonproprietary set of standards.

Outsourcing—the process by which a company arranges for a third party to implement and manage a specific department or function of the company.

Public network—a network operated by common carriers or telecommunications administrations for the provision of circuit-switched, packet-switched and leased-line circuits to the public.

Reengineering—the process of improving performance and cutting costs in a company by redesigning business processes from the ground up.

Wide area network (WAN)—A data network typically used to connect two or more local area networks, often in remote locations, over common carrier lines.

Wireless communications—radio transmission via the airwaves; various wireless communications techniques include infrared line of sight, cellular, microwave, satellite, packet radio and spread spectrum.

SOURCE: ELECTRONIC COMPUTER GLOSSARY

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> *"It's like fax machines. A lot of us never had them, but once we did, we couldn't figure out how we lived without them."*
>
> —*Steve Koss*
> *Accounting and IS Manager*
> *Oakland-Alameda County Coliseum*

The National Information Infrastructure (NII), envisioned as a seamless web of computers, communications networks, databases and consumer electronics products, portends potential new business opportunities and a shifting business paradigm. But, as with the personal computer in the late '70s and client/server computing in the early '90s, many information executives are not yet certain of how and when to exploit the information highway for business value. The key underlying question is, "Now that we have it, what do we do with it?"

One thing is certain: Press coverage of the topic across a range of business and technical media is rampant, and new books on NII navigation and use are published almost weekly. User interest is exploding; in fact, Internet usage has grown 1,000 percent in the last two years alone, with the total number of worldwide users at 32 million, according to the Internet Society in Reston, Va. The NII also is spawning a whole new category of IT-product and -service providers, from online service companies to education and training tools.

How are organizations using the NII now for competitive advantage? What are the benefits and potential pitfalls? What are the NII's ramifications for managing employee, customer and supplier relationships? How can information executives exploit the technologies that exist today while leading their businesses into a fully networked tomorrow? In this special issue of *CIO*, we'll take a look at these and other questions and do our best to demystify the hype. We welcome your comments and feedback about this issue and would love to hear about your own electronic travels.

P.S. The next CIO Perspectives conference, "Managing IT in the Reorganized Enterprise," will be held March 12-15, 1995, at the Westin Mission Hills in Rancho Mirage, Calif. Please join James Champy, chairman of CSC Consulting Group, and your peers at this important program. For more information, call us today at 800 366-0246.

PHOTO BY WEBB CHAPPELL

Coming In CIO

Words of Advice

Tom Davenport, partner and director of research at Ernst & Young's Center for Information Technology and Strategy and director of the IS Management program at the University of Texas, Austin, offers some pragmatic advice to CIOs. Given the quirks of human nature, he says, consider how people *really* use information. Given structural and budgetary constraints, consider how much an organization can *credibly* change. And, given the difficulty of developing and modifying systems, consider how IS can *realistically* support that change.

Driving IT

When the Massachusetts Highway Department began seeking bids for the construction of a new highway through the center of Boston, it stated one condition: Normal patterns of traffic or structure use must not be disturbed. It found contractors to pioneer new construction techniques, but the project's historic contribution could well lie in another dimension of innovation altogether: the most flexible, powerful and densely linked information environment to emerge in civil-engineering IS.

Sweet Victory

When CIOs negotiate with suppliers, the stakes are hardly trivial. New-age management gurus may speak of negotiations in which everyone leaves the bargaining table happy, but some doubt that's possible. Good negotiators come with an agenda and the determination to win as much as possible.

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TRENDLINES

APPLICATIONS

13 WAYS OF LOOKING AT THE INTERNET

- Montana State University's Agriculture Extension Service delivers information on topics such as growing tomatoes and raising beef cattle to remote farmers and ranchers over the university library's CatLink system, which is accessed through the Internet.

- Supercomputer Systems Engineering and Services Co. (SSESCO), a small high-tech firm in Minneapolis, is using the Internet to team up with scientists from Colorado, Pennsylvania and New York on a project to help San Joaquin Valley, Calif., develop a modeling system for ozone emissions.
- Using Internet Mail and the File Transfer Protocol, Department of Energy subcontractor Martin Marietta Energy Systems shares information such as computer-aided design drawings and spreadsheets with others in the industry across the United States.
- The Telecommunications Research Center at the University of Louisville has carried out a series of "teledentistry" trials, sending X-rays of patients' teeth and other data via the Internet to specialists and insurance companies.

- A professor at the University of Oregon is using the Internet to review satellite photos and other information gleaned from a telescope in Chile that is connected to the network.
- The U.S. Air Force has developed an electronic contracting tool that enables it to trade quotation and award information over the Internet with vendors.

- Cisco Systems Inc., an internetworking company in Menlo Park, Calif., grew from a $25 million company to a $6.8 billion company in a few years, thanks in part to its use of the Internet as a "virtual channel of distribution," in which customers recommended the company's products to colleagues on the Net.
- By offering its beekeeping newsletter over the Internet, the Florida Cooperative Extension has expanded circulation enormously, to reach readers from California to Sweden, many of whom previously could not afford to subscribe.

- The U.S. Department of Agriculture was able to respond quickly to victims of Hurricane Andrew by putting out information and receiving requests for help via E-mail until telephone and fax connections were restored.
- Oxford University Press relies on the Internet to help it coordinate editorial work on the 20-volume *American National Biography*, which is being written by thousands of contributors.
- Martin Information Services of Raleigh, N.C., already uses the Internet to exchange data with customers; soon the company—which creates multimedia brochures, manuals and presentations—will be sending its products over the Net as well.
- The Home Learning Centers Project, based in Chelsea, Mass., has enabled normally isolated home day-care providers to share support and information via the Internet.

- Local governments in Virginia share planning information and other resources over the Internet thanks to a project sponsored by Virginia Tech. ■

—selected from 51 Reasons: How We Use the Internet and What It Says About the Information Superhighway, *edited by Martha Stone-Martin and Laura Breeden (FARNET Inc., 1994)*

CRAWL FIRST, WALK LATER

Forrester Research Inc. of Cambridge, Mass., worries that IS organizations may be frightened into paralysis by the sheer enormity of reshaping to support electronic commerce. The firm suggests undertaking some basic first steps as a way to learn about the technology and test customer response.

GRAFT interactive voice response onto existing ordering, account-status or customer-service applications. Supplement it with fax-on-demand to provide hard-copy receipts of transactions.

OPEN UP customer-inquiry, multimedia product-literature and warranty bulletin boards on America Online, CompuServe, Prodigy or the Internet.

PROVIDE customers with electronic-forms software and allow them to E-mail orders via Internet or online services. Offer suppliers LAN outer network dial access to new client/server order-entry or inventory systems.

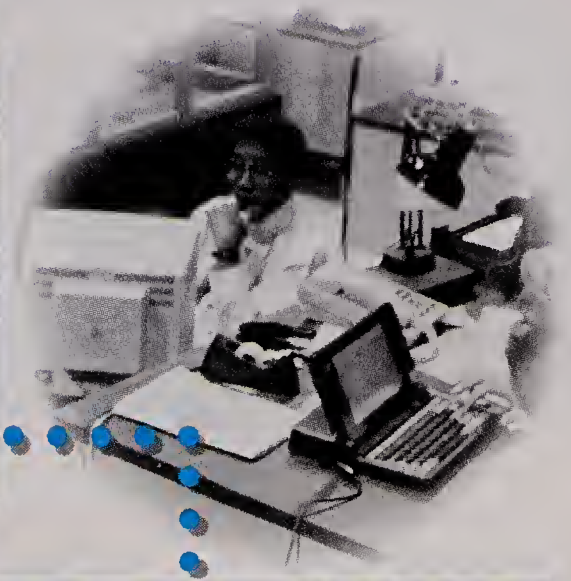
SET UP a networked whiteboard with partners for collaborative design.

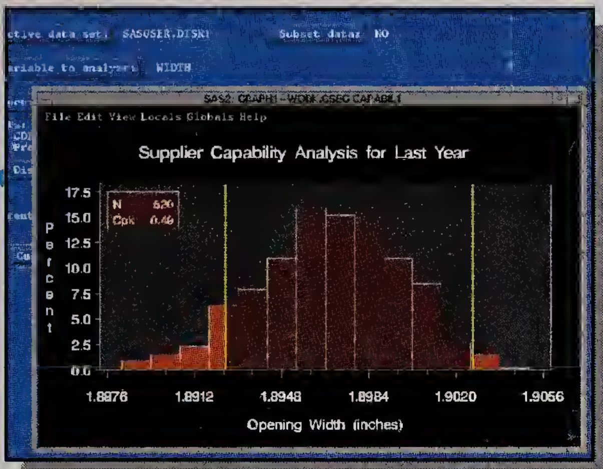
ESTABLISH a Lotus Notes application that uses replication to proactively notify customers of updates in pricing, inventory or warranty information. ■

ILLUSTRATIONS BY MATT FOSTER

The Client/Server Edge for EIS and Beyond

The SAS® System is a new concept in client/server software. It delivers mission-critical data to the desktops of every decision maker… and then lets you turn data into meaningful information. Your servers not only dole out your data but serve up compute resources as well. Millions of records can be summarized, and just the results delivered to the desktop.





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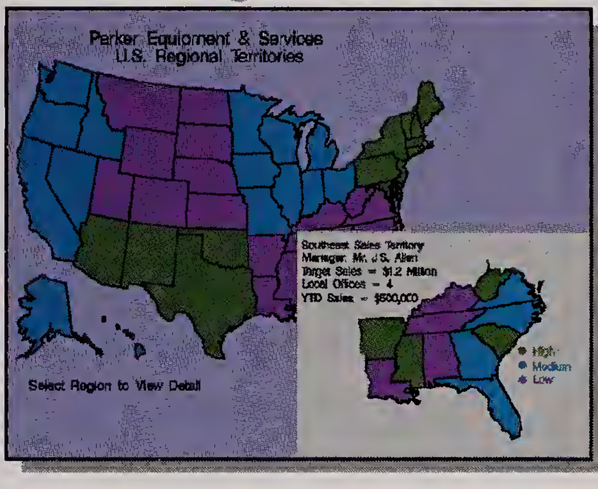
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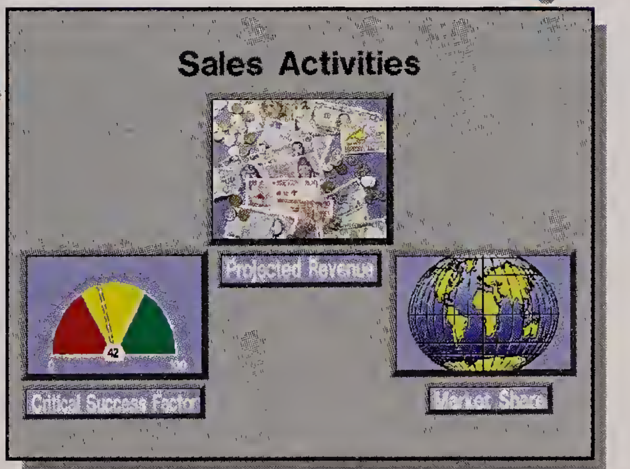
Select Region to View Detail
High
Medium
Low

Southeast Sales Territory
Manager: Mr. J.S. Allen
Target Sales = $1.2 Million
Local Offices = 4
YTD Sales = $500,000



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TRENDLINES

ACCESS PROVIDERS

MAKING AN ENTRANCE

Debating which Internet on-ramp is best for you? *Network World* offers this "Short List" of Internet Access Providers based on the needs of users with multivendor enterprise networks.

National IAPs

- **Advanced Network and Services Inc. (ANS)**
  ANS Internet and WAN Connection Services (800 456-8267)
  If experience is important to you, ANS arguably has more of it than any other national IAP. ANS uses a T3 backbone leased from telephone companies to provide a wide range of Internet connection options from 17 points of presence (POPs) nationwide at up to T3 speed. The IAP adds very strong security via its ANS InterLock Service, which provides data encryption and user authentication, among other security features.
- **Sprint Corp.**
  SprintLink (703 904-2167)
  Sprint is rapidly expanding its Internet access services and becoming a force to reckon with as it launches a new service or access facility every few weeks. Already providing access from more than 400 POPs nationwide, Sprint recently announced that it will provide international Internet access to users in Europe and the Asia-Pacific region. Many regional and local IAPs are using SprintLink for 800-number access to their own services.

Regional IAPs

- **California Education and Research Federation Network (CERFNet)**
  CERFNet (800 876-2373)
  CERFNet stands out for its sophisticated approach to customer service in which a very knowledgeable technical staff quickly responds to user problems and queries. CERFNet was one of the first regional IAPs to cater to commercial users, and it continues to offer a wide variety of commercial Internet access options with up to T3 speed in Southern California and Nevada.
- **BBN Technology Services Inc.**
  NEARNet (617 873-8730)
  NEARNet is right on par with CERFNet in customer service and technical support. It offers New England customers a wide range of connectivity options at up to T3 speed. With the recently announced purchase of the San Francisco Bay Area Regional Research Network and plans to expand its service area beyond New England, NEARNet stands to quickly become a major competitor to national IAPs. ■

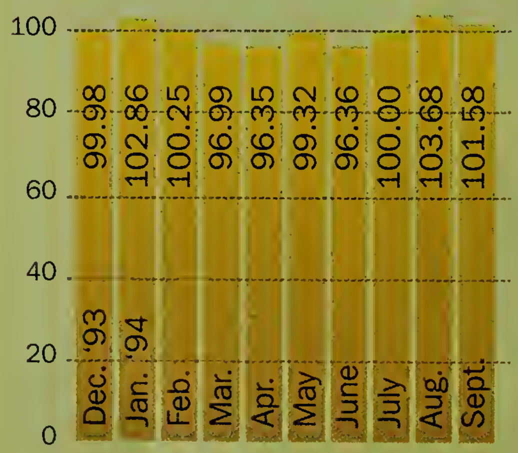
> "The Net is the future, and those without access to it will become like those who are illiterate today."
>
> *–Paul Bingham*
> *DRI/McGraw-Hill*

WALL STREET'S DOUBTING THOMASES

Wall Street isn't buying the highway hype. According to researchers at SCTT Interactive Inc. in Lake Forest, Ill., average stock prices for companies that are investing heavily in the information highway have barely budged since January. The composite stock-price index covers 65 publicly traded companies including telecommunications and computer bigwigs; home-shopping and online-network newbies; and entertainment, publishing and cable behemoths—all of which are betting that Wall Street will eventually reward them for revving their interactive-technology engines. As of August, these companies had a combined market value of $600 billion and annual sales of $400 billion, but the numbers that matter are the stock-price trends—and those have been rather flat. ■

Stock Prices for Interactive Companies Flat for Now

*End-of-month; index: Aug. 1, 1993=100**



**Composite stock price index for 65 companies that have invested heavily in networking technology*

SOURCE: SCTT Interactive Inc.

CHART BY LINDA GOLON

NEW VENTURES

Only a small fraction of CIOs use the Internet to conduct business with vendors (see "A Walk on the Wired Side," Page 50), but many more would if they could. "If a software vendor says, 'We're on the Net,' we say, 'Good for you!'" says James Deck, section manager for research computing at Inland Steel in East Chicago, Ind. "Would that every vendor did that."

One organization that has a long history of dealing with customers over the Net is Digital Equipment Corp., of Maynard, Mass. Among other milestones, Digital was the first computer company to post marketing information on the World Wide Web and to let users test drive a system (the Alpha AXP) over the Internet. Now Digital has established an Internet Business Group that will concentrate on developing new ways of doing business over the Net. The company is betting that such methods will grow in popularity as more corporations move onto the information highway. ■

Free Hurwitz Report.

"INFORMIX-NewEra is exactly the type of client/server development environment developers need to create production-level applications."

Judith Hurwitz
President, Hurwitz Consulting

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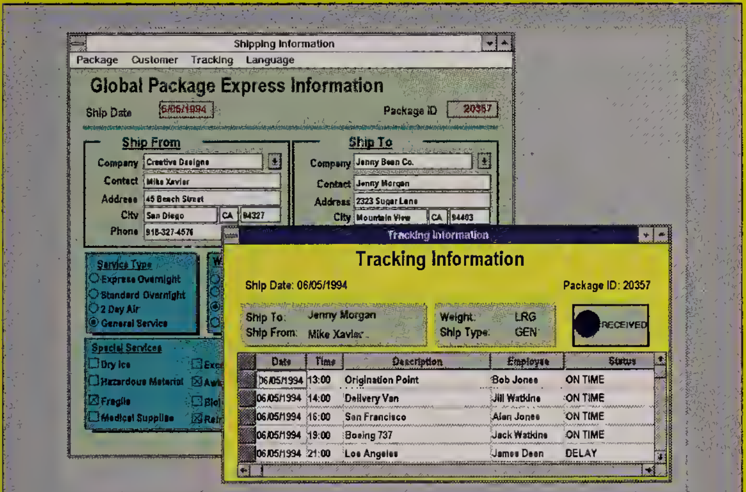

Global Package Express Information

Ship Date 6/05/1994 Package ID 20357

Ship From
Company Creative Designs
Contact Mike Xavier
Address 45 Beach Street
City San Diego CA 94327
Phone 918-327-4576

Ship To
Company Jenny Bean Co.
Contact Jenny Morgan
Address 2323 Sugar Lane
City Mountain View CA 94403

Service Type
○ Express Overnight
○ Standard Overnight
○ 2 Day Air
● General Service

Special Services
☐ Dry Ice
☐ Hazardous Material
☒ Fragile
☐ Medical Supplies

Tracking Information

Ship Date: 06/05/1994 Package ID: 20357

Ship To: Jenny Morgan
Ship From: Mike Xavier

Weight: LRG
Ship Type: GEN

● RECEIVED

Date	Time	Description	Employee	Status
06/05/1994	13:00	Origination Point	Bob Jones	ON TIME
06/05/1994	14:00	Delivery Van	Jill Watkins	ON TIME
06/05/1994	16:00	San Francisco	Alan Jones	ON TIME
06/05/1994	19:00	Boeing 737	Jack Watkins	ON TIME
06/05/1994	21:00	Los Angeles	James Dean	DELAY

INFORMIX-NewEra is designed for creating mission-critical, enterprisewide client/server database applications—the kind used to run your business.

Application developers who have moved to graphical development tools are learning a painful lesson: while prototyping is fast and easy, it's another thing to try to deploy enterprise applications.

Sure, applications built using the first generation of graphical client/server tools *look* great. But ultimately, they don't have the power to scale up to enterprisewide client/server solutions.

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Introducing INFORMIX-NewEra™, the second generation. NewEra has beauty *and* brains. All of the graphical tools you expect are there, backed up by an object-oriented development environment designed explicitly for creating mission-critical, enterprisewide client/server database applications.

Peter Kastner, Vice President, Aberdeen Group:
"INFORMIX-NewEra is an excellent product that understands both the client and server sides of application development."

NewEra's next-generation features include visual programming tools, an industrial-strength object-oriented language, interactive debugger, compiler, repository, and support for team development on Windows or UNIX. It's client/server ready, and it will support open connectivity, so you can use NewEra with non-Informix databases, too.

Jeff Papows, Notes Product Division, Lotus Development Corp.:
"INFORMIX-NewEra offers Notes users the ability to build enterprisewide, client/server applications that extend the value of Lotus Notes."

Complex applications can be developed quickly, using class libraries provided by Informix and our partners. In fact, Informix has already signed up a number of class library partners, including Lotus for Notes, as well as others for imaging, EDI, and more.

Find Out What's Behind The Screens.
We'll send you an independent report from Judith Hurwitz, highlighting the limitations of first-generation client/server tools, and the benefits of the second generation. **Send or call toll-free 1•800•688•IFMX, ext. 32 for your free copy.**

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intel inside pentium PROCESSOR

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It's Plug & Play ready, so it's ready to go when Chicago is.

It has PCI Enhanced IDE, so you can easily add an IDE CD-ROM drive and IDE hard drives all the way up to 8.4GB, when the technology arrives.

And it has 64-bit PCI local bus video, so it's even ready for desktop video conferencing.

This system is also Energy Star compliant, which may soon prove invaluable. (Especially if you work for the Federal Government.)

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Every Dell OptiPlex system comes with a three-year Limited Warranty with hardware coverage above and beyond the norm. That includes your peripherals, factory-installed NICs, even monitors.

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TRENDLINES

INTERNET DESTINATIONS

PLACES TO GO, PEOPLE TO E-MAIL

Not all roads lead to Rome, unfortunately—plenty lead to Akron and Pittsburgh. Similarly, not all destinations on the information highway are of equal interest or appeal. Internet-based publisher Global Network Navigator has selected a dozen destinations that it considers exemplars of the Internet's character and diversity. Here is a sampling:

Science Fiction Resource Guide (*ftp://gandalf.rutgers.edu/pub/sfl/sf-resource.guide.html*): For those who never tire of *Star Trek* trivia; this guide also keeps up with sci-fi books, movies, TV shows and the Hugo Awards.

The Paleontology Server (*http://ucmp1.berkeley.edu/welcome.html*): An interactive natural-history museum where visitors can learn about phylogeny or examine photographs of great white sharks.

Internet Underground Music Archive (*http://sunsite.unc.edu/ianc/*): Intended to apply the principles of free software to music distribution, the archive seeks to promote obscure bands.

New Zealand Information (*http://www.cs.cmu.edu:8001/web/people/mjw/nz/mainpage.html*): Everything you always wanted to know about New Zealand including weather forecasts and speeches in the Maori language.

ArtServe (*http://rubens.anu.edu.au/*): An art-history database consisting of 2,800 images of prints, largely from the 15th through the 19th centuries.

Hypertexted Usenet FAQs (*http://www.cis.ohio-state.edu/hypertext/faq/usenet/faq-list.html*): Answers to the most frequently asked questions about the Internet.

Xerox PARC Map Viewer (*http://pubweb.parc.xerox.com/map*): An interactive application that renders maps based on user input.

International Teletimes (*http://www.wimsey.com/teletimes.root/teletimes_home_page.html)*: Edited by a 16-year-old, this general interest magazine "seeks to present informed opinion and observation drawn from the experience of living in a particular place."

Taxing Times (*http://www.scubed.com:8001/tax/tax.html)*: A repository of tax forms including many IRS publications online. On April 14 of this year there were 10,300 document accesses. ▬

> **"We've all heard about how Pizza Hut is making it possible for people to order a pizza over the Internet. Now I hear a company in Silicon Valley is trying to digitize pepperoni and anchovies. Apparently it's a matter of bandwidth."**
>
> *–Jim Manzi, president*
> *Lotus Development Corp.*

A TOOL FOR OUR TIMES

Mosaic has become "the single most important factor in commercialization of the Internet," Internet architect Vinton Cerf told *The Wall Street Journal* recently. Mosaic now claims about 1 million users, and that is expected to increase rapidly thanks to a number of developments. Among them: Mosaic Communications, based in Mountain View, Calif., has decided to give away rather than sell its new software tool, Mosaic Netscape, used to search business information on the World Wide Web. And IBM and Microsoft are including Mosaic-like browsers in versions of OS/2 and Windows. ▬

THE NEXT BEST THING TO BEING THERE

Perhaps it's our age-old fascination with other worlds that has inspired many to regard the Internet not just as a vehicle for communication but as an almost tangible location where people can gather, wheel and deal. Ubique Ltd. of San Francisco has chosen to embody the metaphor of the "virtual place" in its new family of Internet-based services, which transform trade shows, service centers and training facilities into online environments.

The first Virtual Places product provides access over the Internet to trade shows for people who can't attend in person. Exhibitors create virtual booths including interactive product displays, literature and multimedia demonstrations. Attendees can access those booths using Ubique's Sesame navigator software and interact with staff in real-time. They can also retrieve product information; sit in electronically on conference sessions, panel discussions and keynote addresses; and plan their itineraries using an online show directory. And vendors can collect business cards and customer profiles online for follow-up. For information, call 415 896-2434. ▬

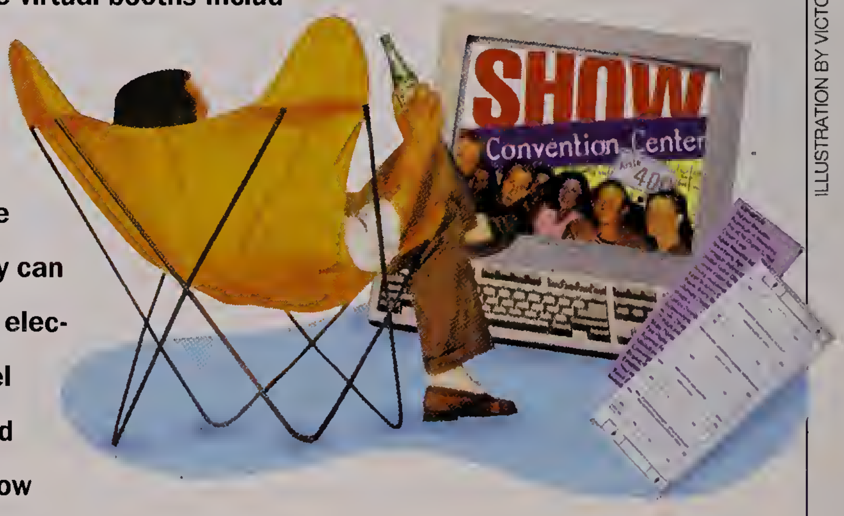

ILLUSTRATION BY VICTORIA KANN

When Data Is Lost In Minutes, It's An Act Of God.

When Data Is Recovered In Minutes, It's An Act Of EMC.

By the end of this sentence, an unforeseen disaster could disrupt your business. But don't worry. By the end of this ad, you won't be concerned.

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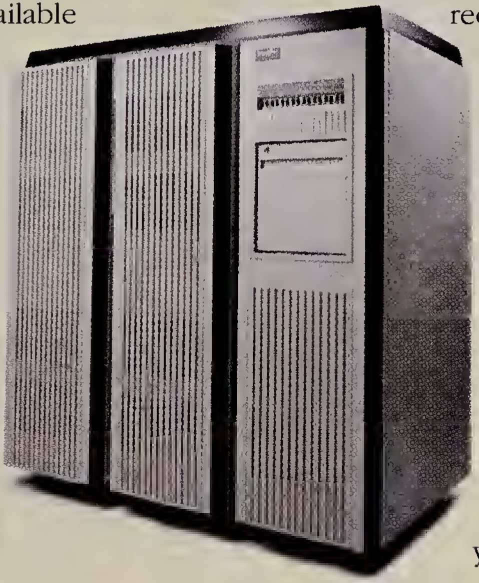
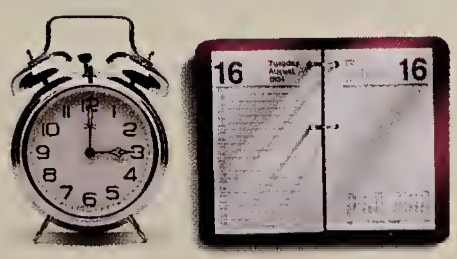
Now, with SRDF, a recovery process that took days is reduced to minutes because all your data is instantaneously duplicated at a remote location, as of the last transaction, making a complete copy available in the next building, state, country or continent.



And that means no time-consuming rehearsals since SRDF is automatic and doesn't require people, eliminating human error.



Disaster recovery in minutes, not days.

No CPU overhead or host intervention. No loading tapes onto trucks for a costly road trip.

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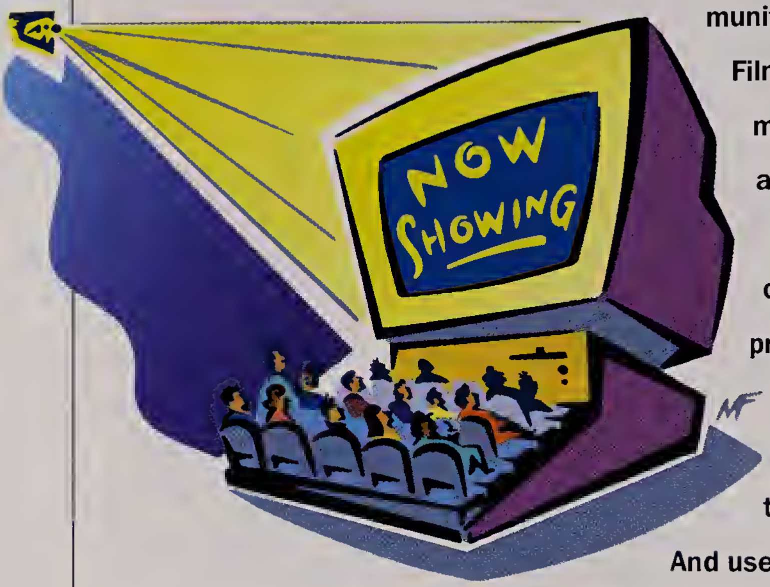
TRENDLINES

MVFF@WELL.POPCORN

OK, it's not exactly Cannes, but last October the Mill Valley Film Festival became the first event of its kind to go online. The Whole Earth 'Lectronic Link (WELL)—one of the oldest and most iconoclastic Internet Access Providers—set up three computers with live Internet connections at the festival, enabling attendees to compose reviews of new releases like *Hoop Dreams* and *Mrs. Parker and the Vicious Circle* for the networked community at large. Film and multimedia artists also used the Net to discuss recent projects and to post clips of their work. And users with access to the World Wide Web could pull up program notes and graphical pages created by attendees with the help of WELL support staff.



"As far as we know, Mill Valley [was] the first film festival in the world to have such a large presence on the Internet," says the event's executive director, Mark Fishkin. The festival also hosted an interactive media exhibit with non-movie-related seminars on demystifying the Internet and keeping up with emerging technologies. The WELL is based in Sausalito, Calif., and can be reached at 415 332-4335 or *info@well.com*. ■

> **"Every technology company out there can define the information highway for you. It's the strategic vision for whatever the company happens to sell."**
>
> *—James Abrahamson, chairman, Oracle Corp. Quoted in* Byte *magazine*

EASY CLICKINGS

Fitting the Internet into a box is a feat somewhat akin to passing a camel through the eye of a needle—but SPRY Inc. claims to have managed it. The Atlanta company's product is supposed to make using the Internet so easy that even a really, really, really smart child can do it.

According to SPRY, Internet in a Box is the only software package that provides individuals and small businesses with instant access to the Net, as well as compatibility with hundreds of Internet service providers. It includes fully supported and enhanced commercial versions of Internet E-mail, FTP, Usenet News, Gopher and Telnet, as well as the first commercially developed version of NCSA Mosaic, which provides point-and-click access to text, graphics, audio and video.

Internet in a Box can be installed and configured automatically using SprintLink. Contact SPRY at 800 777-9638 or *info@spry.com.* ■

More Of The Same

Clearly, CIOs see the Internet/NII as an extension of the tools they already support. More than three-quarters of respondents to a CIO survey who are connected to the Internet are using primarily E-mail and information-retrieval applications, and those two functions remain by far the most popular five years out. The possibility of actually doing business over the NII apparently remains remote to many: Applications like sales and marketing and purchasing scored poorly.

Most Popular Internet/NII Applications	Percentage of 235 Respondents* Today	In 5 years
E-mail	71	87
Global electronic bulletin board	32	75
Real-time electronic conversations	19	58
Data retrieval from electronic libraries, etc.	73	100
Electronic publishing	25	76
Distribution channel for software and services	23	65
Telecommuting and field support	17	63
Technical support	35	66
Other customer support/services	6	47
Sales and marketing	9	49
Purchasing products and services	11	54
Training and education	15	58

*Percentage of 235 respondents who identified application as one they use now and/or expect to use in five years. Respondents were not limited in how many applications they could choose.

Source: CIO Magazine

ILLUSTRATION BY MATT FOSTER; CHART BY MICHAEL SIGGINS

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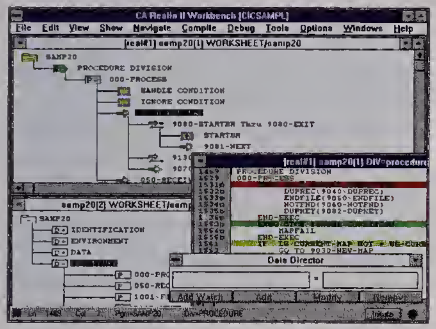
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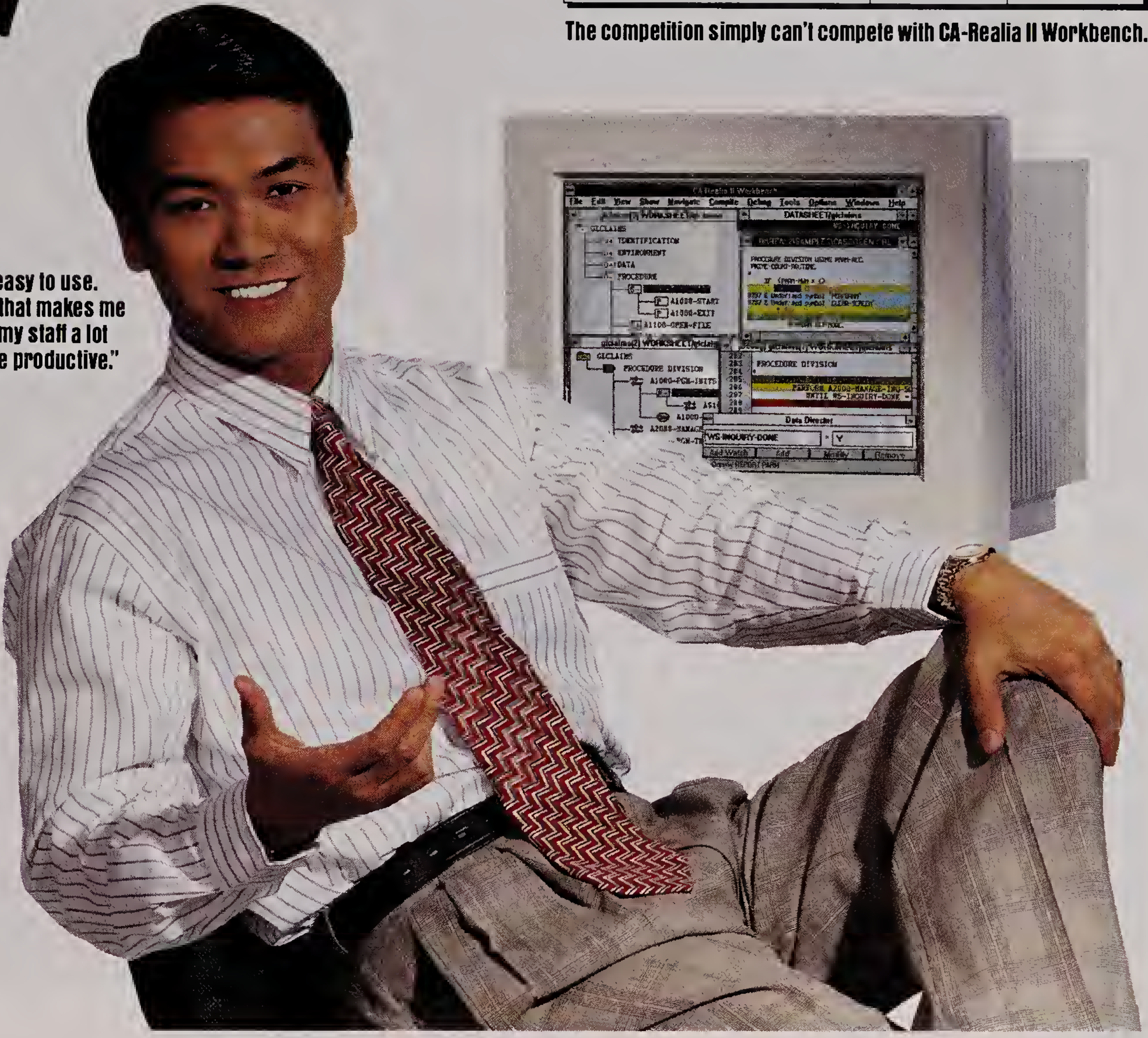

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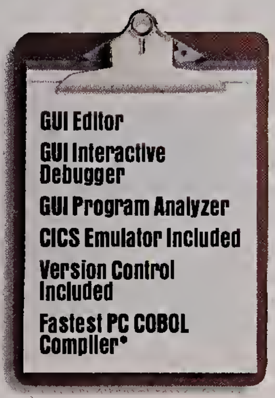

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Who Will Lead?

BY RAY HOVING

It's Monday morning. On the way to work, you recall the dream you had last night. Your company announced record earnings and growth for the fifth year in a row. Over half the firm's sales (and most of the growth) come directly from the electronic marketing and distribution channels you initiated several years ago. Your employees are highly motivated, thanks in part to flexible schedules that enable them to work at home, on the road or in the office. Although you're worried about your father's failing health, it's comforting that a portable monitoring system lets him live at home, while still under round-the-clock care by medical professionals. It was fun last night watching your 11-year-old pull information from Australian World Wide Web files for use in a school report.

Or...

It's Monday morning. On the way to work, you recall the nightmare you had last night. Your company's on the verge of bankruptcy; market share has dropped 80 percent. You could kick yourself for choosing the wrong standards to interconnect with your trading partners. Your employees are leaving for jobs that offer a virtual office as a way to balance their professional and family lives. Your father had a heart attack; luckily a neighbor got him to the hospital in time. Your kids stayed up too late watching *Beavis and Butt-head* reruns on Channel 512.

Both these visions are possible. The enabling technology exists. The scripts are consistent with socioeconomic trends. Then what could make the outcomes so different? Luck? Or *leadership*?

The National Information Infrastructure (NII)—or information highway if you prefer—is a much-discussed topic. Telecommunications, cable, computing and entertainment companies are striking mega-deals in the race to dominate the information age. Experts predict $2 trillion to $3 trillion of private investment as the highway evolves, with the government's share around $100 billion. Corporate desktop PC penetration is near 100 percent. Almost every home has a TV, and more than a third have computers. The Clinton administration has given the NII a prominent place on the national agenda.

So where will the leadership for the creation of the NII come from? Profit-minded service providers? Politically motivated government officials? Both camps believe they have the answers, but other voices should be heard. I would suggest a third source of leadership: CIOs—experienced, pragmatic executives who represent the business users of the NII.

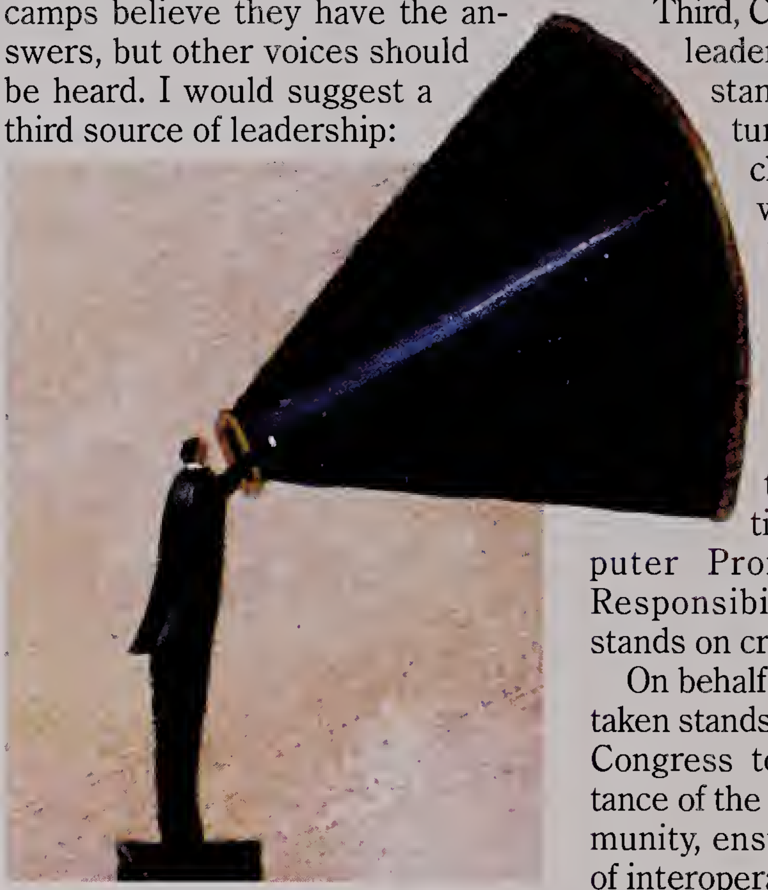

ILLUSTRATION BY DAVE CUTLER / SIS

To be effective leaders, CIOs should take three actions on the NII. First, they must learn about the potential uses and misuses of the information highway. That means understanding the social and technological trends that are driving computing power into homes, schools and businesses, and the way companies are changing their relationships with customers and suppliers through electronic commerce. Second, they must ensure their companies have a strategy for electronic commerce, with special emphasis on competitive positioning. An offensive strategy would involve experimentation and early adoption: The risks are higher, but so are the potential rewards. A defensive strategy would mean monitoring and reacting quickly to market opportunities or competitive moves. The worst strategy—and unfortunately the most common—is passivity. Companies are blindsided by opportunities and competitive threats because they were asleep at the switch. It is the CIO's responsibility to prevent this.

Third, CIOs can also demonstrate leadership now by taking stands on NII issues. Unfortunately, most won't. It's a classic case of "my vote won't count." But collectively, our voices can be heard. Organizations such as the Society for Information Management (SIM), the College of Healthcare Information Management Executives (CHIME) and Computer Professionals for Social Responsibility (CPSR) are taking stands on critical issues.

On behalf of its members, SIM has taken stands on pending legislation in Congress to recognize the importance of the NII to the business community, ensure timely development of interoperability standards, protect intellectual property rights and rights to data privacy, and enable free-market forces to shape service offerings. Unfortunately, the 103rd Congress could not pass the much-needed telecommunications reform. Hopefully the 104th will.

Why not add your voice to those Washington needs to hear? You owe it to yourself, your company, your family and the future.

Ray Hoving is MIS director for the Process Systems Division of Air Products and Chemicals Inc., in Allentown, Pa. He serves on the Executive Committee for SIM and leads that organization's Advisory Council on the NII. For more information about SIM's efforts, Call 312 644-6610.

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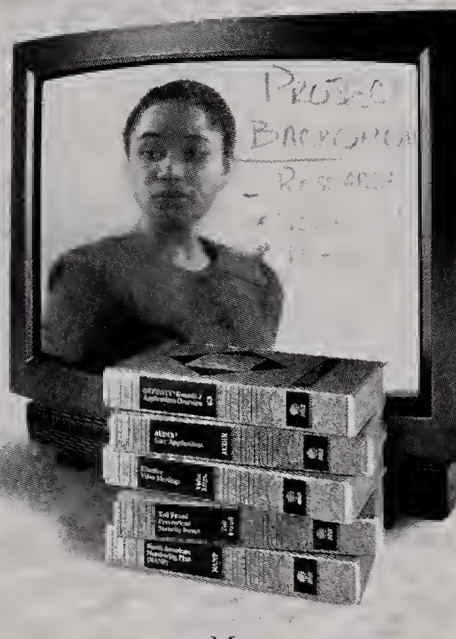

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Getting Your Ducks Online

In this special issue of CIO, *we explore what IS executives must concern themselves with now in order to help their companies exploit the opportunities of the online future*

THE MEDIA HAS BEEN GIVING the information highway the kind of feverish attention usually reserved for coverage of a war. It is the only subject besides war (and until recently, health care) that is practically guaranteed daily ink in our national papers of record. Every strategy, every skirmish, every new alliance is reported and analyzed. On a single day in September, you could plunk down 35 cents at any newsstand and read about the Home Shopping Network's purchase of the Internet Shopping Network, America Online's new advertising division, *The New York Times'* venture into electronic help-wanted ads and CompuServe's decision to become a global service provider for businesses wanting to connect to the Internet.

The reason for this intense interest may be our ever-increasing recognition of the immense changes technology can work in our lives. We define the 20th century as much by innovations as by events: the age of the automobile, the age of television, the age of information. So cognizant are we of the moment's significance that we can actually feel the paradigm shifting beneath our feet. In this, we are like a father videotaping his child's delivery—furiously documenting the beginning of something we expect to change our lives forever.

Yet despite—or perhaps because of—all this attention, individuals and organizations are finding it hard to understand their places in the larger story. They know that the National Information Infrastructure (NII)—envisioned as a seamless web of computers, communications networks, databases and consumer electronics products—is supposed to open up glorious new business opportunities for their companies. But what those opportunities are, and how CIOs can help realize them, remain vague. Pizza Hut received tremendous publicity for its decision to let customers order pies over the Internet; but as entertaining as such applications might be, they hardly light the way for a bank, an airline or a utility company.

That IS executives are uncertain of the information highway's potential is clear from the results of a random survey of almost 250 readers that *CIO* magazine conducted last summer. While about half the respondents said the information highway would prove useful or critical to their organizations, less than 5 percent of their businesses are currently using the Internet (considered the NII's precursor) in any formal or systematic way. Furthermore, nearly three-quarters said they rarely or never use the Internet in their own jobs. And while most respondents are prepared to accept the Internet as an extension of their companies' electronic communications tools, they are having trouble envisioning killer applications that the NII might eventually spawn.

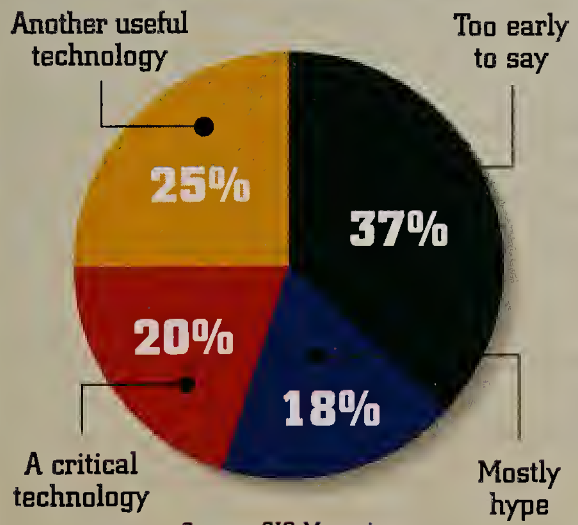
Still, a minority of enthusiasts are already making strategic hay from the Internet, or at least doing some serious mowing in preparation for the NII. Some, like Dean Trilling of American Greetings, are enhancing their careers by identifying and developing new interactive-business opportunities. Others, such as Steve Koss of the Oakland-Alameda County Coliseum, are using the Internet to test the commercial potential of home-grown products. Many others are gathering competitive intelligence, performing corporate research projects, managing vendor relationships and generally making themselves and their IS staffs more indispensable than ever to their organizations.

The purpose of this issue is not to laud the future of electronic commerce nor to cheerlead the creation of a great national network that, like Godot, may never materialize. What we hope to do instead is help our readers understand their roles in this emerging environment, and how they can exploit technologies that exist today while leading their businesses into a fully networked tomorrow. We will also address issues such as interoperability, security and costs that our survey identified as major concerns, and explore the information highway's potential to become an extraordinary business tool, not just an extraordinary metaphor.

How CIOs Feel About the Information Highway

Opinions about the information highway are split down the middle. Nearly half of our respondents see the technology trend as useful or critical to their businesses. The rest think it is mostly hype or are reserving judgment.

Percentage of 235 Respondents



Source: CIO Magazine

An Internet Glossary

What follows are some basic Internet-related terms that appear in this issue.

Archie	tool for locating files on the Internet
File Transfer Protocol (**FTP**)	method for transferring documents among computers
Gophers	menu-based Internet exploration tools
Mailing Lists	information on designated topics that is routinely delivered to subscribers by E-mail
Mosaic	popular graphical user interface for navigating the Internet, includes hypertext links
Telnet	tool for accessing remote computers without long-distance charges
Usenet	collection of electronic bulletin boards (newsgroups) on an enormous range of subjects
Veronica	search tool that tracks Gopher menus
WAIS (**Wide Area Information Service**)	client/server tool for searching online databases
World Wide Web	hyperlinked system for retrieving information resources on the Internet

This issue will *not* tell readers how to get on or around the Internet, nor is it a guide to online-service providers or tools. The number of books and journals dealing with those subjects appears to be growing as rapidly as the number of Internet users: For help in finding that information, see "Internet Library" on Page 76.

We hope this issue of *CIO* proves educational and provocative. At press time, *CIO* was in the process of getting its own direct connection to the Internet, and that address will be published in future issues. In the meantime, if you have any comments or suggestions, please contact us at *ciomag@mcimail.com*.

–Leigh Buchanan

Surfing for Dollars

The NII presents information executives with both opportunity and risk. Here we go again.

BY RICHARD PASTORE

REMEMBER WHEN THE CLIENT/server wave first approached, how some CIOs pooh-poohed the hype and stayed ashore while others foresaw its benefits and set sail? The former probably wound up with eggy faces, as the technology proved to be the most important computing paradigm of the last 30 years. No one can say whether the National Information Infrastructure (NII) will make as momentous a splash, but there's an undercurrent of déjà vu here. CIOs again face a choice: to take the helm and head into uncharted waters or risk missing the boat and getting dunked.

As happened with client/server, many believe commerce on the information highway will transform the way business is conducted and recast the CIO's responsibilities. The National Science Foundation is clearing the way for more commercial transactions now that it is ending its Internet funding and lifting its ban on most commercial uses of this national computer network. No longer will commercial use be limited to bulletin-board postings, electronic mail and searches of government and academic databases; now businesses can sell services, advertise and generally ply their trades with abandon. In addition, advances in protecting online credit-card transactions and the recent trial of the first international electronic-cash system ("cyber bucks") could greatly accelerate the launch of commercial services: Forrester Research projects that companies will be doing nearly $5 billion worth of business online by 1998.

Some companies have been exploiting the Internet for some time, offering travel bookings and taking orders for flower deliveries online. Others are just now testing the possibilities: Pizza Hut Inc. is taking food orders over the Net in a California test market; Encyclopædia Brittanica Inc. has just finished testing an online version of its reference tomes (see related story, Page 36).

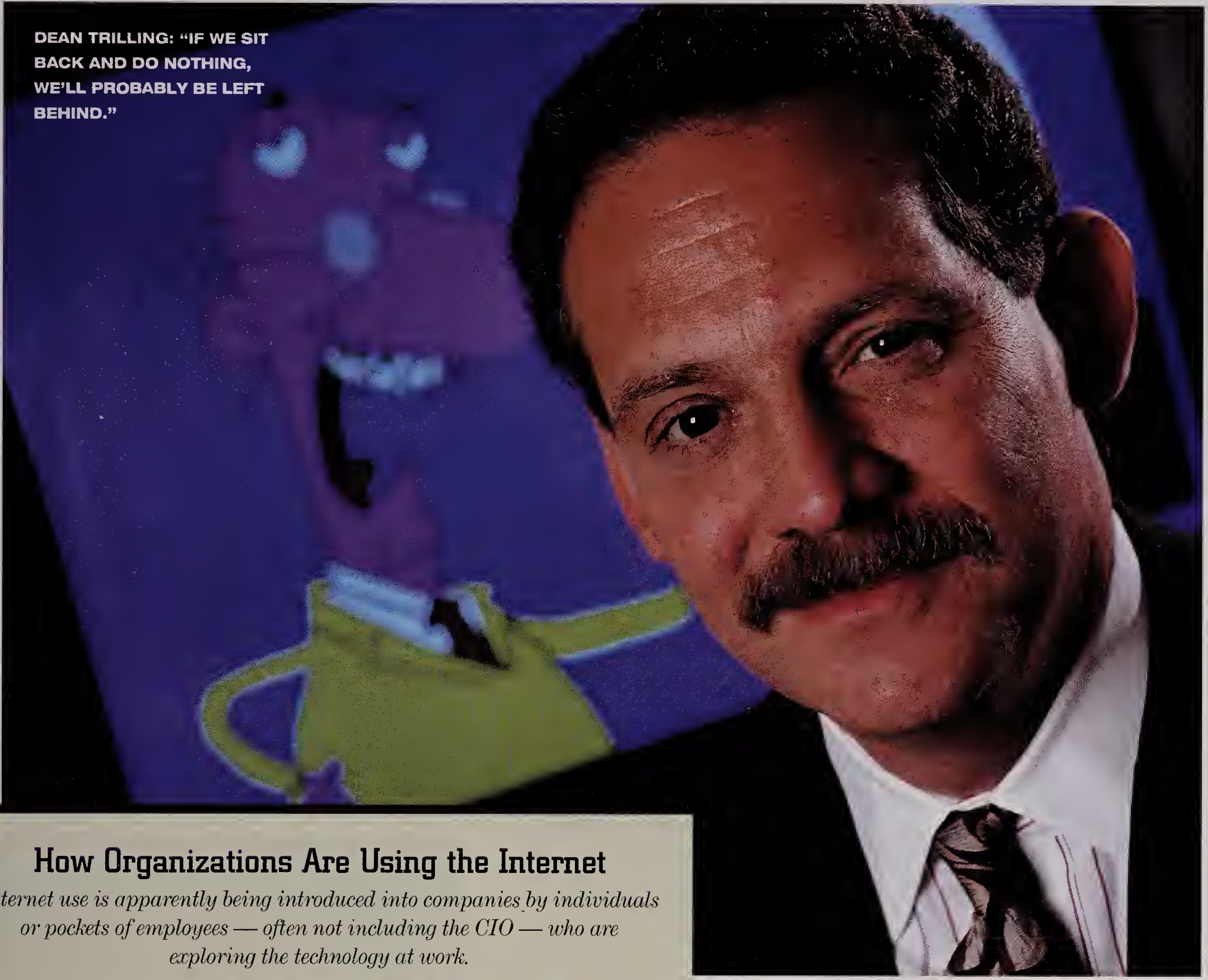
Admittedly, there is a lot of hyperbole on this subject, and it's off-putting to corporate executives baptized in the project-oriented, the profit-driven, the day-to-day. But CIOs who've squinted through the haze of hot air swear something big is looming. Almost half of 235 IS leaders surveyed by *CIO* claim the NII will be useful or critical to their businesses, and their gut tells them they ought to be doing something about it.

"It's going to happen whether we do anything or not. If we sit back and do nothing, we'll probably be left behind," says Dean Trilling, former vice president of information services at American Greetings, and now vice president of interactive marketing.

Fortune Hunters

Trilling is a full-time NII opportunity seeker. "My job is helping people to understand what technologies there are, how they're evolving and how they might be applied to complementing and expanding our business," he explains. The Cleveland-based greeting-card maker uses the Internet and other online venues for communication with peers and to reduce paperwork between its sales group and retail buyers. It also hopes to use the NII for product promotion and distribution, marketing electronic versions of greeting cards enhanced with animation and sound.

Some observers argue that IS leaders should leave it to the business functions to root out commercial opportunities, limiting their own role to communicating the techno-



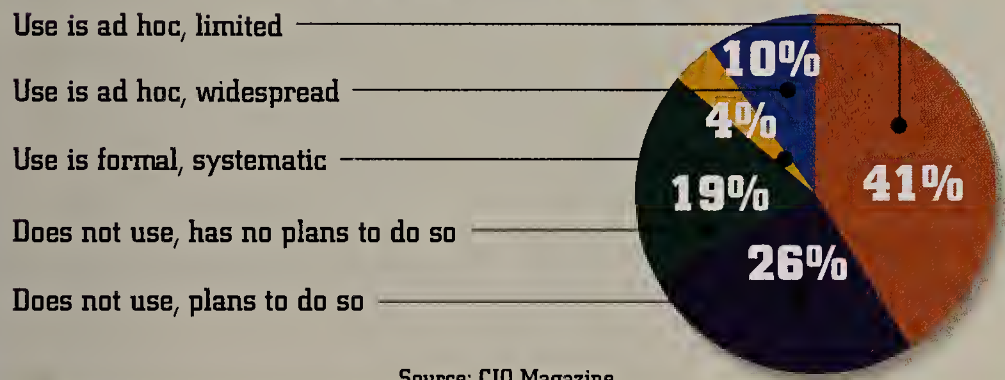
DEAN TRILLING: "IF WE SIT BACK AND DO NOTHING, WE'LL PROBABLY BE LEFT BEHIND."

PHOTO BY ROGER MASTROIANNI

How Organizations Are Using the Internet

Internet use is apparently being introduced into companies by individuals or pockets of employees — often not including the CIO — who are exploring the technology at work.

Percentage of 235 Respondents



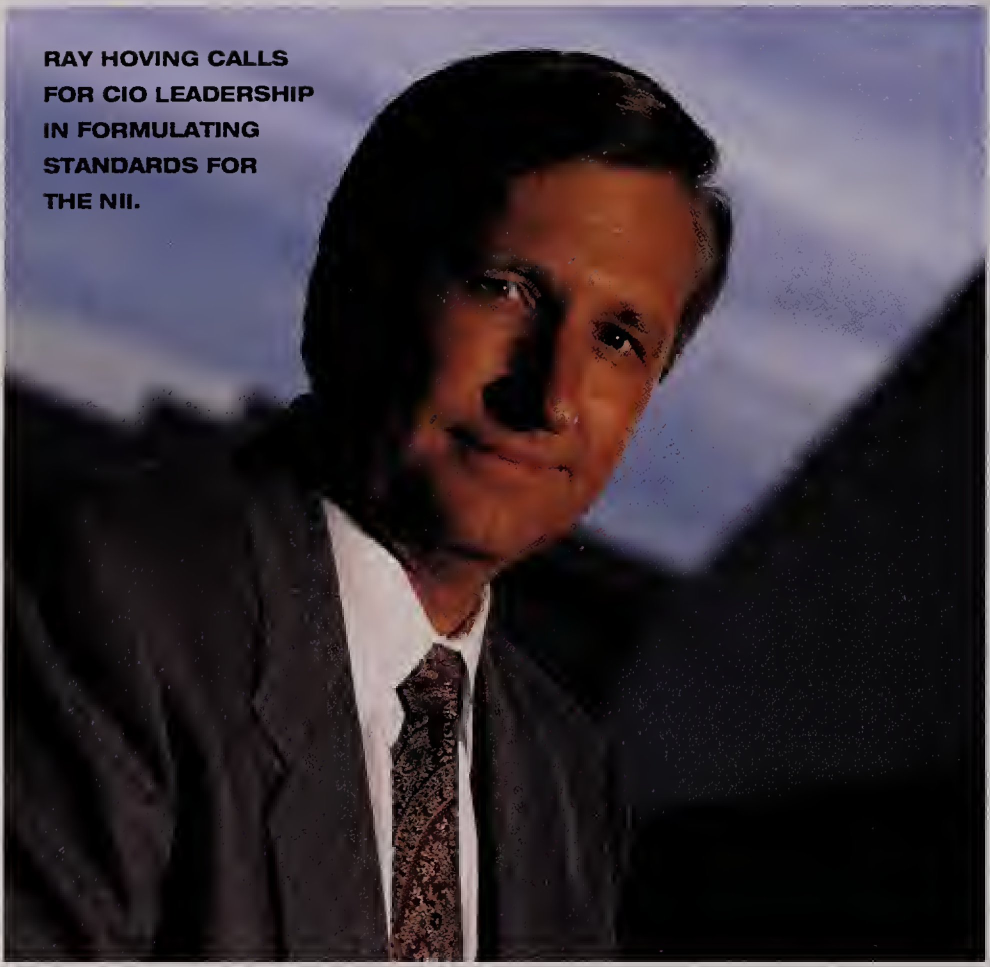
Source: CIO Magazine

logical capabilities. But many disagree. "The smart, well-positioned CIO can really help to move the company along by thinking business opportunity first and not technology looking for a business solution," suggests Ray Hoving, director of MIS for the Process Systems Division of Air Products and Chemicals Inc. in Allentown, Pa. "They can educate the executives of the firm and dream along with them to make that vision into reality." Hoving also chairs the Society for Information Management's (SIM) National Information Infrastructure Advisory Council.

How do CIOs flush out commercial NII opportunities? Often the IS leader or a designate tackles the problem as a member of a multidisciplinary management task force or team. At Motorola Inc. in Schaumburg, Ill., the corporate IS department has teamed with marketing and public relations on NII usage projects. Various groups are also studying wireless-access issues and looking beyond today's electronic-checking capabilities to electronic cash, credit and traveler's checks.

At publisher CCH Inc. in Riverwoods, Ill., the Internet task force includes people from IS, product management, the knowledge organization (editorial content), the strategic group, and domestic and international staff. The group's chairwoman, who

In contrast to the role of opportunity visionary, the CIO should also play the skeptic, piercing the puffery of pundits and vendors.



RAY HOVING CALLS FOR CIO LEADERSHIP IN FORMULATING STANDARDS FOR THE NII.

> *"If CIOs find themselves in a service trap, a way to call attention to technology's implicit part in business strategy is to lay out a business case for the Internet."*
>
> –LARRY BURDEN

hails from the strategy organization, devotes 75 percent of her working time to the team and its mission: identifying NII product opportunities (such as online product catalogs) and enhancements to customer service (such as E-mail updates and the ability to accept orders electronically).

Hands On

To be a good opportunity seeker, a CIO has to cultivate some online expertise. The best way to learn is to do it. "If you don't have your own Internet address, you're not in the game," says Walter Menning, vice chairman of information services at the Mayo Foundation in Rochester, Minn. "I was given an address before I even asked for one; experts in our research community got me started."

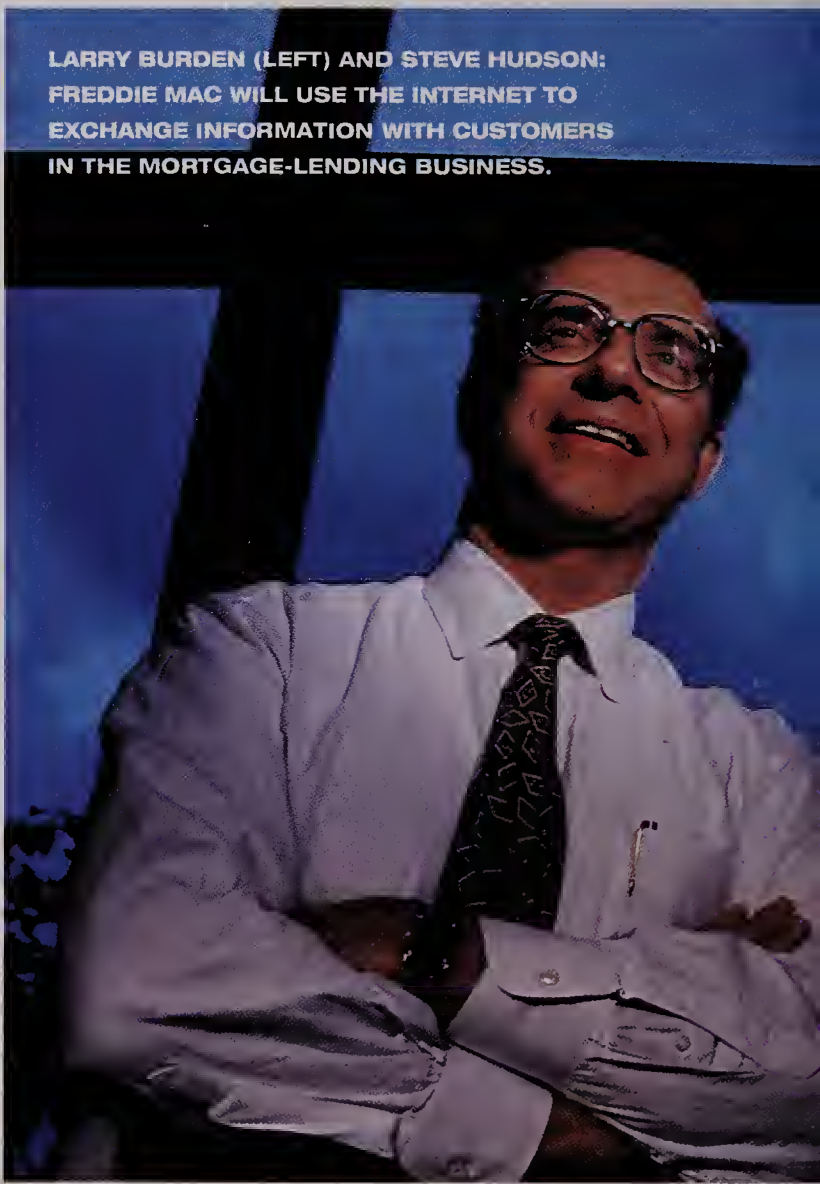
Menning's Internet forays revealed a network that can provide much more than the electronic mail and bulletin boards he'd heard about. "I found a whole range of information there that's continually evolving," he says. Menning supplemented his online education with a few books and a class. Now he's spearheading such potential uses as transmission of price quotes, confirmation of shipments and technical advisories between Mayo and its suppliers.

Those who've been there warn first-timers to beware of unrealistic expectations. "It's like playing the piano. You can't just sit down for a half-hour and expect to get it," says Steve Hudson, vice president of technology strategy at Federal Home Loan Mortgage Corp. (Freddie Mac) in McLean, Va. Unless the CIO is willing to invest some time and knows what he or she is looking for, the Internet can be disillusioning.

A Say in Standards

In contrast to the role of opportunity visionary, the CIO should also play the skeptic, piercing the puffery of pundits and vendors. "We must remain well-read and listen with a jaundiced ear to the claims of the vendors," Hoving cautions. "We must put an air of pragmatism on it, too, because there's a lot more hype than reality."

Pragmatism is perhaps most important in the area of standards and interoperability. CIOs need to ensure that they are working in a standards-based environment and that the systems they assemble will interact. There's a good chance that when vendors "add value" to basic standards like Mosaic and World Wide Web services by extending functionality and services, they may create



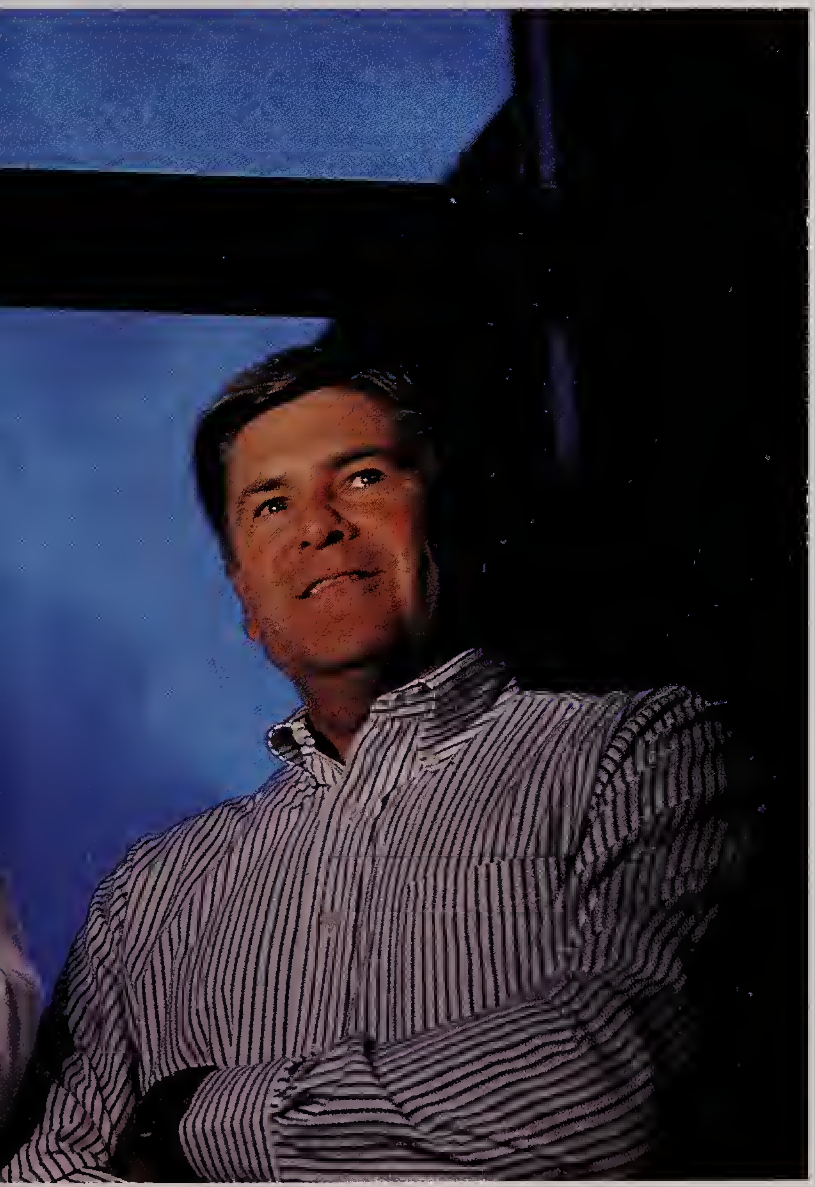
LARRY BURDEN (LEFT) AND STEVE HUDSON: FREDDIE MAC WILL USE THE INTERNET TO EXCHANGE INFORMATION WITH CUSTOMERS IN THE MORTGAGE-LENDING BUSINESS.

PHOTO ABOVE BY KEN KAUFFMAN; PHOTO CENTER BY KATHERINE LAMBERT

incompatible systems, warns Jack Gold, senior research analyst at The META Group in Westport, Conn.

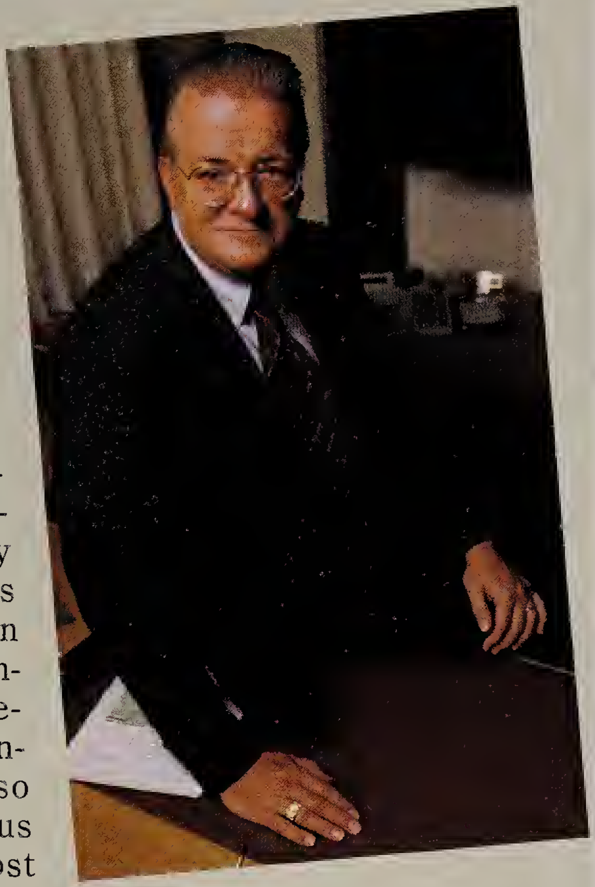
NII standards are a moving target that bear watching, and it behooves CIOs to participate in their formulation (see "Who Will Lead?" on Page 26). "If the CIO is standing back and letting these standards emerge bottom-up from the user community, then the CIO is out to lunch," Hoving says. Who is in a better position, he argues, to draw together the interests of the individual users for the good of the whole?

Another IS executive pounding out NII policies and procedures is Paul Weekes, Motorola's director of information technology management. As a member of the Financial Services Technology Consortium, a cross-industry working team dedicated to defining the NII, one of his top concerns is ensuring security of electronic payments. Few businesses will trust financial data to the wiles of today's Internet, where anyone from hackers to housewives might take an unauthorized peek. The consortium is studying ways to electronically verify identification to validate financial transactions.



With a Little Help

IS executives are not alone when it comes to concerns over the NII. Thanks to affiliations and councils, there's no need for them to proceed in a vacuum.



JOSEPH MCNAMARA: RAYTHEON IS PART OF A REGIONAL ALLIANCE WORKING ON STANDARDS FOR INTERNET COMMERCE.

CIO societies are a growing forum for NII discussion. Eric K. Marcus, chief technology officer of publisher CCH Inc., is a member of the Chicago Research and Planning Group (CRPG), a league of regional IS executives who address a variety of common business and technology issues. Marcus joins small CRPG discussion groups that meet monthly to hash over management topics like electronic commerce. He also uses the group's Lotus Notes network to post queries for the membership at large.

Other external alliances are more specific to electronic commerce. Regionally oriented, they spring up under the auspices of chambers of commerce or telecommunications councils that hope to promote electronic business. The Massachusetts Telecommunications Council is working on initiatives that include a standardized model for Internet commerce and access to the World Wide Web, says Joseph McNamara, corporate director of IT at member company Raytheon Co. As a participant, Raytheon benefits by encouraging NII interoperability among its trading partners. McNamara benefits by gaining greater insight into the issues and problems he shares with peers.

Some information-highway alliances have gone national, such as CommerceNet, a Palo Alto, Calif., organization originally devoted to Silicon Valley firms. AVEX Electronics Inc., of Huntsville, Ala., is a charter member. "There's tremendous value in being a member," says AVEX Vice President and CIO Thomas Giordano. "These user groups are key to understanding the value and direction of the technology and to getting in early on that direction."

–R. Pastore

PHOTO ABOVE BY JOE FIFE

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In the Pipeline

Some companies are already learning to hang ten

While construction on the information highway has barely begun, some organizations are already gearing up for networked commerce by taking a test spin on the Internet.

Among them is Pizza Hut Inc. The fast-food giant, which uses the Internet to communicate with vendors and advertising agencies, has been test-marketing an Internet order-taking system in Santa Cruz, Calif. Customers access "PizzaNet" on the World Wide Web, specify their pizza fixings and enter identifying information; the order zips to Pizza Hut headquarters in Wichita, Kan., which then reroutes it to the closest Santa Cruz outlet.

Dan Cooke,vice president of MIS, says the service targets a new market: computer users. "From a business standpoint, one of the important components of our strategic direction is having pizza everywhere and anywhere our customers may want it," Cooke says. But he and his staff are still grappling with management issues, such as verifying orders and protecting the company's proprietary software.

Meanwhile, Chicago-based Encyclopædia Britannica has been using the Internet for E-mail, corresponding with contributing writers and answering customer research and product questions. In addition, Britannica just finished beta testing an Internet version of its encyclopedia, Britannica Online.

The company will license its online product directly to colleges and universities at an annual cost of $1 per student, with a $5,000 minimum and $35,000 maximum per campus. Students at those schools will be able to access Britannica with the Mosaic graphical browsing tool.

If successful, Britannica Online will be expanded to other user communities, such as schools and libraries. Officials say they view the electronic encyclopedia as a new product, supplementing the 226-year-old company's traditional bound volumes rather than replacing them. But the Internet version does offer some distinct advantages.

Britannica Online will contain constantly updated versions of regular encyclopedia articles as well as supplemental materials such as Britannica Classics, a series of about 1,000 articles by well-known specialists and writers. The Classics articles, long out of print, will only be available electronically.

In fact, the project itself came together over the Internet. "The project team that developed Britannica Online is widely dispersed across the United States," says Larry Merrick, Britannica's vice president of MIS, who facilitated the process. Project developers on both coasts and several cities in between exchanged concepts, ideas, designs and programs over the network for several months.

As the Internet continues growing and changing, Merrick says, it will bring new challenges, new opportunities—and new headaches. "It will evolve, and we have to adapt with it."

–Anne Stuart

"I think CIOs should at least monitor the activities of groups like this," Weekes says. Many are more vendor-oriented than user-oriented at the moment. "But user representatives such as myself get firsthand knowledge of where vendors and this industry are going."

A Coordinating Role

As with personal computers a decade ago, NII expertise seems to infiltrate an organization through the back door and propagate unnoticed in shadowy pockets. IS executives must cultivate this grass-roots expertise to ensure that it benefits the whole enterprise.

"The role of coordination is important; otherwise users might go at cross-purposes," says Joseph McNamara, Raytheon Co.'s corporate director of IT in Lexington, Mass. McNamara and crew have labored to standardize interfaces and access services for Raytheon's decentralized user communities. He's also committed to promulgating the fruits of their labors. "Ideas that originate in our D.C. Heath publishing unit may be of use in our appliances organization." D.C. Heath currently uses the NII to distribute product catalogs. Other Raytheon units post requests for proposals on the Internet.

Enterprisewide coordination is a prerequisite for another CIO responsibility—implementing consistent security firewalls and usage-management policies. When there are scattered pockets of end-user expertise, it's difficult to manage the ways people use the Internet, according to Marc Mangus, MIS manager at Geoworks. To ensure security, Geoworks has resorted to a "draconian setup" that allows no incoming inquiries to this Alameda, Calif., maker of operating-system software, Mangus says. When coordination improves, such restrictions can be relaxed. Geoworks uses the Internet today to exchange files and communicate with partners in the personal digital assistant business, such as Casio Inc. and Sharp Corp. Eventually, the firm hopes to take customer orders, process payments with credit-card data and ship product—all via the NII.

Usage management is another province of the CIO—and one that requires a deft balancing act. On one hand, the CIO should be the Internet time cop, implementing management controls that allow employees to maximize their productivity without getting lost in cyberspace and time. On the

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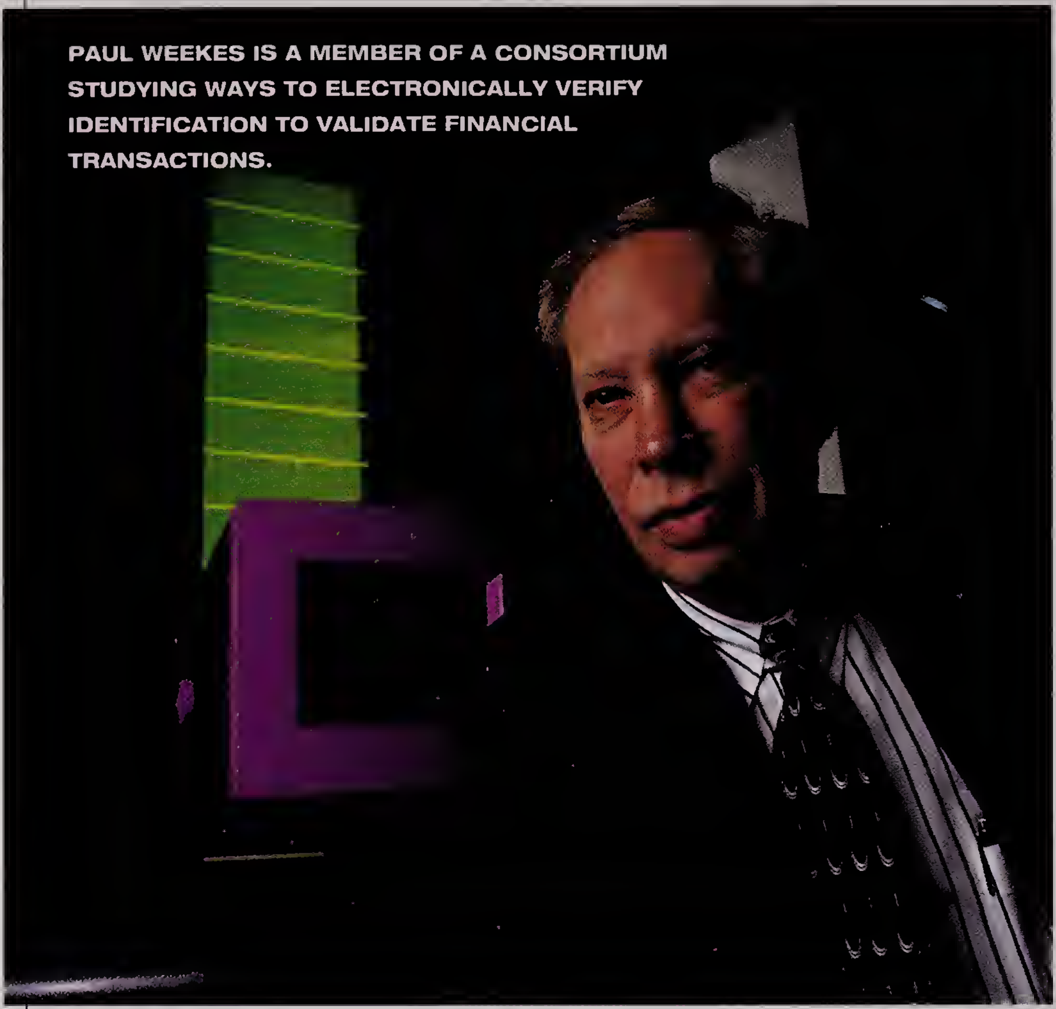

PAUL WEEKES IS A MEMBER OF A CONSORTIUM STUDYING WAYS TO ELECTRONICALLY VERIFY IDENTIFICATION TO VALIDATE FINANCIAL TRANSACTIONS.

PHOTO BY MARK BERLOW

NII expertise seems to infiltrate an organization through the back door and propagate unnoticed in shadowy pockets. IS executives must cultivate this grass-roots expertise to ensure that it benefits the whole enterprise.

other hand, creativity and information gathering can be stifled by restrictive policies and policing, says Peter Fingar, advocate for information technology at the University of Tampa. One way to achieve a balance would be to set up strategies that allow employees to gain access to the Internet and go "surfing" on their own time, such as making dial-in access available from employees' homes, Fingar suggests.

Accounting Practices

Cost justification, that perpetual IS nemesis, will pervade NII commerce one day; but for now, CIOs are catching a break from this obligation. Most novice Internet navigators have paid scant attention to cost/benefit analyses. "We haven't thought about it, because the cost is trivial at this point," Motorola's Weekes says.

Eventually justification will become imperative. When NII commerce necessitates expenses such as dedicated staff support and business-process or product reengineering, things will get dicey. The first step will be to determine the costs, including the fees paid to a reliable NII access provider. Even this will be tricky: There is concern that usage-based charges may replace today's flat access fees, throwing more uncertainty on the ultimate cost.

Second will be examining the market to learn if enough potential customers or trading partners are online to make the venture worthwhile. "Some industries like pharmaceuticals or oil will find few customers...on the Internet today. There will just be technical people," says David Taylor, vice president and research director of The Gartner Group Inc.'s Electronic Commerce Strategies practice.

If the customers are there, Taylor says, CIOs must figure what it might cost to reach their targets by traditional means—mailings, phone calls, sales visits, dedicated networks—and compare that with the online costs. For example, Motorola would weigh the costs of transmitting software on the Internet versus distributing it on disk. "We'll look at the business case for every specific application," Weekes says.

"We're already doing that," notes Larry Burden, senior vice president of information services and strategies at Freddie Mac. The lender is justifying the cost of reengineering business processes to accommodate the Internet and its own industry-specific network, Goldworks. To do this, Freddie Mac weighs the costs against the expected benefits—more market share, faster product introductions and better partnerships with customers. Beginning next year, the firm will use Goldworks and the Internet to exchange information with customers in the mortgage-lending business.

Career Consequences

CIOs seeking to exploit the NII have no well-established standards, no clear technology leaders to look to and few navigational markers to guide them on their way. But if the technology can be plied to enrich the business, it may pay off in CIO career enrichment as well.

At American Greetings, electronic marketing is seen as so crucial to the company's future that former CIO Trilling received a promotion to lead the charge. He now reports to the chairman and CEO rather than the senior vice president of operations.

Freddie Mac's Burden agrees that spearheading NII commerce is a chance for IS leaders to break out. "If CIOs find themselves in a service trap, a way to call attention to technology's implicit part in business strategy is to lay out a business case for the Internet," he says. If it truly is the next wave, the NII will lift all boats, including CIOs'.

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The Road to Webville

Before dipping your organization's feet in the waters of the Net, you'll need to address some pressing questions. Such as: It's eleven o'clock. Do you know where your domain is?

BY FRED HAPGOOD

OVER THE LAST 10 YEARS, COMputer networks have integrated intracorporate functions—division and management levels—to great effect. The Internet offers the chance of repeating this harvest of productivity over the next 10, this time on the field of intercorporate relations, by making the interactions of buyers, sellers and competitors/colleagues faster, cheaper and more intelligent.

Some of these relations can be advanced by "surfing" the Net: getting out into it, navigating through its newsgroups and databases. An employee-surfer can advance many commercially valuable ends: He or she can head off rumors, pick up marketing leads, elevate company visibility through discreet posts and signature tags, get a feel for industry trends and locate valuable data resources.

However, many buyer-seller relations (including customer service, marketing, bid solicitation, catalog searching and order taking) cannot be promoted by surfing. These functions need a home base: a place people and computers can surf to and interact with, a site where profit-making companies can make information publicly available. These Internet stores or offices, as sites are also known, started opening this year and have been multiplying at a furious rate. As of September 1994, the population numbered somewhere between 1,000 and 2,000 (there is no canonical census) and seemed to be doubling every two months.

Perhaps the conceptually simplest variety of Internet site is a "mailbot," or autoresponse E-mailer. For instance, an emerging practice is for a corporate Internet site to be programmed to respond to messages addressed to "info" (as in *info@companyname.com*) with a short description of the company and the phone and fax numbers and E-mail addresses of its major departments. The term "info" is also emerging as the Net equivalent of "To whom it may concern," used whenever an E-mail correspondent has a real message to send but no idea to whom it should be directed. (Thus the site manager should arrange to have someone periodically check through all the messages addressed to "info" for queries requiring further attention.)

Auto-response E-mail can be put to some pretty advanced uses. Customers of Sparco Communications, of Starkville, Miss., a mid-size electrical supply house, can use E-mail to search the company's 50,000-item catalog by both product category and price. The general manager of Sparco, Mubashir Cheema, says that a good fraction of Sparco's natural market is international (since American prices for electrical and electronics gear are usually lower than prices in foreign countries), and the Internet offers a cheap way to organize that market. Doing business via Internet E-mail instead of international voice phone and fax saves large sums for both sides. "Sparco would die without the Internet," he says.

While mailbots are cheap, flexible, powerful, relatively easy to maintain and accessible by something like 30 million people (the number estimated to have Internet-capable E-mail accounts), they might already represent yesterday's technology. As of fall

ILLUSTRATION BY JOHN BLECK

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The Net is a libertarian utopia: There are no building inspectors, zoning boards, historical commissions or abutters' committees on the Internet (at least not so far). All the doors are open.

1994, most of the sites on the Net have been built (or rebuilt) around what are known as web pages: programs that permit a user to link to sequences of graphics, music, video clips, files and text, in any order or combination, by clicking on icons displayed on the screen. Users can point and shoot through these links to weave a wide range of media experiences, drawing from commercial, educational, cultural or recreational sources as they like. Many believe that this combination of multimedia presentation modes and ease of use will bring hundreds of millions of users into the medium worldwide by the end of the decade.

Whether based on mailbots or web pages, or any of several other technologies, Internet sites have much the same virtues. Visitors can search through more information than would be practical to print and mail, in any format, using customizable text filters and searching tools. The lack of long-distance charges makes every buyer and seller in the world equally accessible. Finally, the medium is a libertarian utopia: There are no building inspectors, zoning boards, historical commissions or abutters' committees on the Internet (at least not so far). All the doors are open.

On the other hand, this very range of choices means that those responsible for building an Internet site will find many fascinating problems bidding for their time. Some will be technical (Sparco decided to write its database/server software internally); many will be fuzzier. The value of a site rises in direct proportion to the number of intercorporate relations it handles, and it may well fall to the site manager to nag, cajole, shame, sweet-talk and even bribe (through discounts) his suppliers and customers to start using the site instead of the fax or mail. Sanj Kharbanda, general manager of Wordsworth Books, a bookstore in Cambridge, Mass., would like to mount book displays on his site's web page (*http://www.wordsworth.com*), for which he needs a full inventory of digitized jacket graphics. In theory, publishers ought to be uploading these files to his site automatically, especially since many digitize their covers for production purposes anyway. In reality, not many book publishers even know the World Wide Web exists, and this perforce has become part of Kharbanda's job. (He gets some help from enterprising authors hoping for a good display position in his cyberstore.) In another case, Sparco's suppliers are accustomed to releasing their price changes monthly, a pace that makes no sense when it is possible for a competitor to read and then undercut a price change on Sparco's database remotely, automatically and in minutes. So Cheema is trying to persuade his suppliers to post price changes instantly and continuously. "It'll take years," he sighs.

As the number of Internet sites grows over the next few years, promotion of the site itself will become a constant struggle. One promotion strategy is including the site address and perhaps a bit of copy in regular display ads (as in the Yellow Pages), in logos and letterheads, and on business cards. A second is listing the site address with the various Net directories. There are many of these: The world is full of clever graduate students writing bigger and better directory services, of widely (and constantly) varying sophistication and popularity. (*http://www.directory.net/* and *http://www.biotech.washington.edu* are both important.) Some databases specialize in retail and others do not; some require manual updating and others poll your site with "web-walking robots" to see if your index of services has changed. At least for the near term, it will be up to the site managers to make sure their sites are listed with the leading directories.

A third approach is to sponsor services. Security APL of Chicago, a company that sells portfolio-management systems to investment managers, has a portfolio-management game running on its page (*http://pawws.secapl.com*); Moesbooks of Berkeley, Calif. (*http://moesbooks.com/moe.htm*), carries book reviews; International Visa's "home page" (*http://www.visa.com/visa/*) is scheduled to carry free credit-card-management software and an online ATM-locator guide. Some believe that in the near future almost all of the data services that are now sold over the Net—games, news, data libraries—will be available free, sponsored by companies as an enticement to visit their web sites. A completely new variety of service beginning to appear on some sites is the "Net filtrate"—a cross section of Net traffic and resources of special interest to a particular trade or class of user. Presumably, the struggle to attract surfers will also drive up the production values, the visual and musical design of web pages them-

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Some believe that in the near future almost all of the data services that are now sold over the Net—games, news, data libraries—will be available free, sponsored by companies as an enticement to visit their web sites.

selves. (Perhaps someday Andrew Lloyd Webber will be producing web pages for GM.)

The fourth approach to promotion is to school or flock with other Internet sites by exchanging web links, icons that when clicked on deliver the user directly to the other site. This raises the difficult question of whether it is better to exchange links with a peer (and competitor) or with a business selling a different but complementary product. Is a flower store better off exchanging links with another flower store or with a hospital? Both strategies have their advocates. Moesbooks, for instance, lists many book dealers. "The more people doing this, the better off we are," says Robert Eliason, corporate "computer guy."

Many other questions come up in the process. How should you treat the people visiting your site? Can you ask them to fill out a marketing survey? Should you feel free to sell the data collected thereby? Or their E-mail addresses? Is it appropriate to E-mail unsolicited offers to visitors? Should you take credit-card numbers over the Net? (Many sites do, so far without incident, but surely some thief will figure out how to abuse the medium.) Is it a nice touch or an invasion of privacy to put photographs of your employees online? What sort of a firewall do you need between the Internet and your LAN? How many of these decisions can be delegated to Internet "presence" providers, and how many have to be managed internally?

Faced with all these perplexities, a CIO might well decide to postpone establishing a corporate presence on the Net. Even so, certain steps should be taken now: specifically, registering your company's name as its site address, or domain name. (In the E-mail address *joe@acme.com*, "acme" is the domain.) Domains are assigned on the vanity-plate model: The applicant gets to use any string of characters he likes that does not conflict with the choices of prior applicants. As of this writing, about 20,000 *.com* domains have been registered, and thousands more are going every month. Your company's name might have been taken already; if not, it will be. In May a researcher at *Wired* magazine found that 14 percent of the Fortune 500 companies had already had their company name registered as some other company's site address. (Sprint even registered MCI, albeit not for long. But the potential for malicious mischief may be somewhat on the wane—at least as relates to direct competitors. A recent New York arbitration decision, reported by Peter H. Lewis in *The New York Times*, "ruled that the *Princeton Review* had no right to establish an electronic address using the name of its chief rival.")

While it is certainly possible to register a site under a noncorporate name, site promotion is simpler all around if it can ride on the awareness of a pre-existing identity. Also users who are trying to reach a company but don't know its address often send mail to *info@company.com* just to see if they get lucky.

While a CIO can register his company name himself (call 703 742-4777), many Internet access providers do this virtually continuously. (Sending a blank message to *wwwproviders@finesse.com* will return a partial list of providers that perform this service.) You will need to open an account with the registering provider, but there are no restrictions implied by that: Domain names can be moved from one provider to another or taken in-house at any time.

The argument for standing on the sidelines is that, given time, Internet commerce will develop stable features and standard answers to these questions. The opposing argument is that noise, chaos and indeterminacy are in the nature of the territory, and that anybody standing around waiting for the dust to settle will be waiting right into retirement.

There is no way of knowing which view is right. Noah Shachtman, director of information technologies at Newman Communications, a company based in Milford, Mass., that does literary public relations on the Net, offers this strategy: "In an uncertain, ever-changing environment, it seems to me that one ought to plant electronic seeds liberally. Try a great many different things—some will work; most will not. The important thing is not to be completely married to one particular aspect of the Net; rather, one should be committed to the general goal of bringing the business into the online arena. The particulars of how exactly one implements this commitment can change, but the underlying dedication should not." CIO

Fred Hapgood is a science and technology writer based in Boston and the author of Up the Infinite Corridor. *His online address is* fred.hapgood@channel1.com.

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A Walk on the Wired Side

Though they still constitute a small minority, some IS executives and their organizations are putting the Internet to good business use

BY LEIGH BUCHANAN

GOOD NAVIGATORS ARE PRIZED by the U.S. Coast Guard, and Mike Powers is adept at charting a course through that most circuitous of channels—the Internet. As an IS manager for the USCG, he uses the Net almost daily, E-mailing external customers (tow-boat companies, state and local governments), collecting data for major projects (a pollution-response plan mandated after the Exxon Valdez disaster) and tracking relevant White House developments (he downloaded the National Performance Review three months before it was available through normal channels). Consequently, he seemed like an ideal source for an article on how organizations are using the Internet in their day-to-day operations.

Only one hitch: When we tried to contact him for this story, Powers was on a ship at the North Pole.

Powers is an interesting guy. The Coast Guard encourages its staff to follow diverse career paths, so he gets to indulge his two passions: information technology and ice-breaking. He accepted the position of executive officer on board the USCG Polar Sea after serving as information resource manager for the Eighth Coast Guard District in New Orleans; prior to that, he had alternated IS positions in cities like New York and Alameda, Calif., with ice-breaking missions on the Great Lakes. "The afloat assignments resemble long sabbaticals," says Powers. "I return to the information/communications discipline refreshed and ready to deal with the extraordinary changes and challenges."

But just because Powers is many miles from civilization doesn't mean he's left the benefits of online connectivity behind him. He continues to use the Internet—preparing outgoing E-mails on his Gateway 2000 Colorbook, then loading them onto a PC that connects with the ship's UHF satellite communications system. The system links through an Air Force satellite to a minicomputer run by the University of Miami at Malabar, Fla., which is in turn connected to the Net. That's how Powers was able to talk with *CIO*, and it's also how he managed to exchange information with the stationmaster of a research base at the South Pole. "Their reply came a couple of days later while we were still in the ice pack," says Powers. Still, for an area where Federal Express does not deliver, it's a damn sight faster than huskies.

Of course, there are plenty of good, practical reasons for using the Internet besides corresponding with *CIO* from the North Pole. And while a survey of 235 IS executives conducted by this magazine last summer turned up a paucity of true believers, many of the 9 percent who did report using the Net regularly in their jobs were enthusiastic about its benefits and eager to preach to the unconverted. "It's like fax machines," says Steve Koss, accounting and IS manager at California's Oakland-

MIKE POWERS STAYS CONNECTED EVEN AT THE NORTH POLE.

PHOTO BY ALEX MARES-MANTON

Alameda County Coliseum. "A lot of us never had them, but once we did, we couldn't figure out how we lived without them."

The snapshots that follow were culled from interviews with more than a dozen Internet-initiated readers. The majority of their companies have been active on the Net for one to three years; a few established their connections only in the last six months; and the University of Alaska has been connected for almost a decade. Most connect to the Net through regional Internet Access Providers (IAPs), although several are still using the more limited capabilities of services like CompuServe and America Online, with plans to move to an IAP in the near future. And while most of those interviewed are among a handful of proficient users in their organizations, several are already supporting a growing base of employees eager to tap into the Net's resources on their own.

Oakland-Alameda County Coliseum

Oakland, Calif.

For some people, knowing how the Rolling Stones concert went over in Japan is more than just a matter of idle curiosity. At the Oakland-Alameda County Coliseum, for example, employees use such information to make decisions about bookings and crowd control, and they get it from a mailing list on the Net devoted to the performance-arena industry. "Last

The Internet is how Powers was able to talk with CIO, *and it's also how he managed to exchange information with the stationmaster of a research base at the South Pole.*

"Through the Net, once you've established a rapport and you're giving answers to people, then other people will respond to you. It basically costs nothing."

–STEVE KOSS

year, we were monitoring Michael Jackson when he was in Russia," says accounting and IS manager Koss. "That way, when he came to someone's building, they knew generally what to expect."

Koss is the Coliseum's Internet expert—in fact, he is one of the few people in his organization using it at all. A few years ago, the Coliseum developed a time/event-management program that, among other things, automates employee scheduling. Wanting some outside feedback, Koss put a demo of the program up on the Internet. The comments he received were helpful, he says, and the visibility didn't hurt—especially since the Coliseum wants to market the application externally.

Koss also turned to the Net when an industry-group committee on which he serves was charged with developing an economic-impact model for arenas, exhibit halls and convention centers. The final product was about 40 percent drawn from Internet resources, including government documents and information Koss found stored at the University of Indiana. When the model was completed, Koss used the Net to search out experts in economics to read and comment upon it.

"If we went to a typical consultant, you're looking at a $10,000-to-$20,000 fee for the same thing," he says. "Through the Net, once you've established a rapport and you're giving answers to people, then other people will respond to you. It basically costs nothing."

PHOTO BY ERIC MILLETTE

STEVE KOSS: "IT'S LIKE FAX MACHINES. ONCE WE HAD THEM, WE COULDN'T FIGURE OUT HOW WE LIVED WITHOUT THEM."

Perhaps Koss's favorite use of the Net is what he calls the "back-door approach" to gathering information. Whenever he reads an especially intriguing article in a magazine or newspaper, he fires off an E-mail to the writer or editor, asking for additional information or some way to contact quoted sources. "There's better odds you're going to get a response from the E-mail than through a fax, a letter or a phone call," he explains.

Showboat Operating Co.

Ventnor, N.J.

In the days before Michael Wood discovered the Internet, competitive intelligence was not part of his job. Showboat Operating Co., which builds and manages casinos, employed a research group or clipping service to collect data about its own and competitors' projects; the information was received on paper and stored in notebooks. But as the gambling industry took off in recent years, it soon became apparent that that method just wasn't good enough anymore. "The intelligence issue became very big," says Wood, who is the company's vice president of MIS. "The president wanted information, and he wanted it in a way that could be easily accessed."

Increasingly, the company has looked to Wood and his organization for information on subjects like Australian gambling laws and the spread of slot machines on Indian reservations. Wood harvests that data from online news releases and forums, then stores it in a recently developed database. Using Lotus Notes as a front end, he can then share the information electronically with the rest of the company.

The importance of E-mail has also increased since Showboat began expanding globally: The company will soon open a casino in Sydney, Australia. "Suddenly we have to be able to communicate across the international date line daily, and there are time differences and other complications we didn't have to worry about when we were just dealing with Atlantic City and Las Vegas," Wood says. He is also conducting an online conversation on quality and reengineering with the U.S. Navy's manager for TQM stationed in South Korea.

As more people in the company become proficient in using the Net, Wood expects international communication to expand and the number and cost of face-to-face meetings to decline. "As much as Australia is a great place to be, traveling there is like aversion therapy," he says. "If [using the Net] saves me one trip a year, I'm ecstatic."

PHOTO BY REED RAHN

MICHAEL WOOD: THE IMPORTANCE OF E-MAIL HAS INCREASED SINCE SHOWBOAT BEGAN EXPANDING GLOBALLY.

University of Alaska

Fairbanks, Alaska

The University of Alaska has been on the Internet since 1986, but Executive Director of Information Technology John Lehman estimates that the number of users has grown 1,000 percent in the last two years alone. Internet usage has become so extensive that the organization recently went from a 56Kbps to a T1 connection, and Lehman expects to be up to a T3 connection by the end of the year. Faced with this surge of demand coupled with declining budgets, IS has been diverting internal resources to net-

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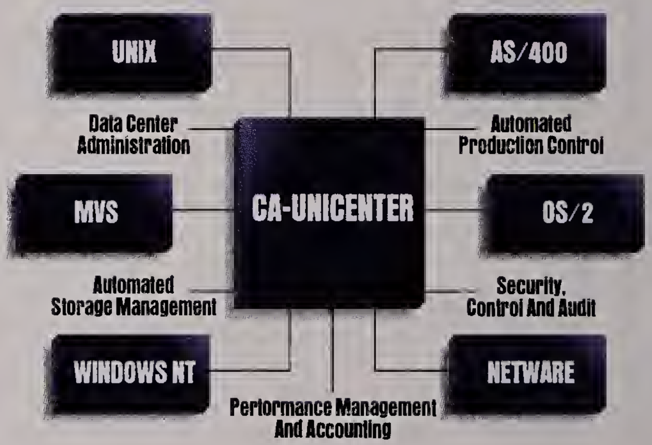
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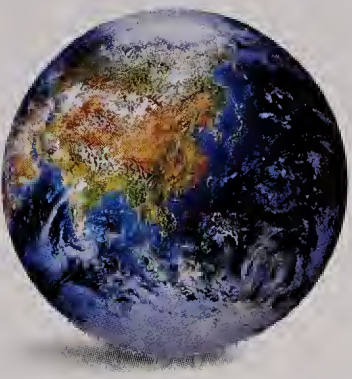

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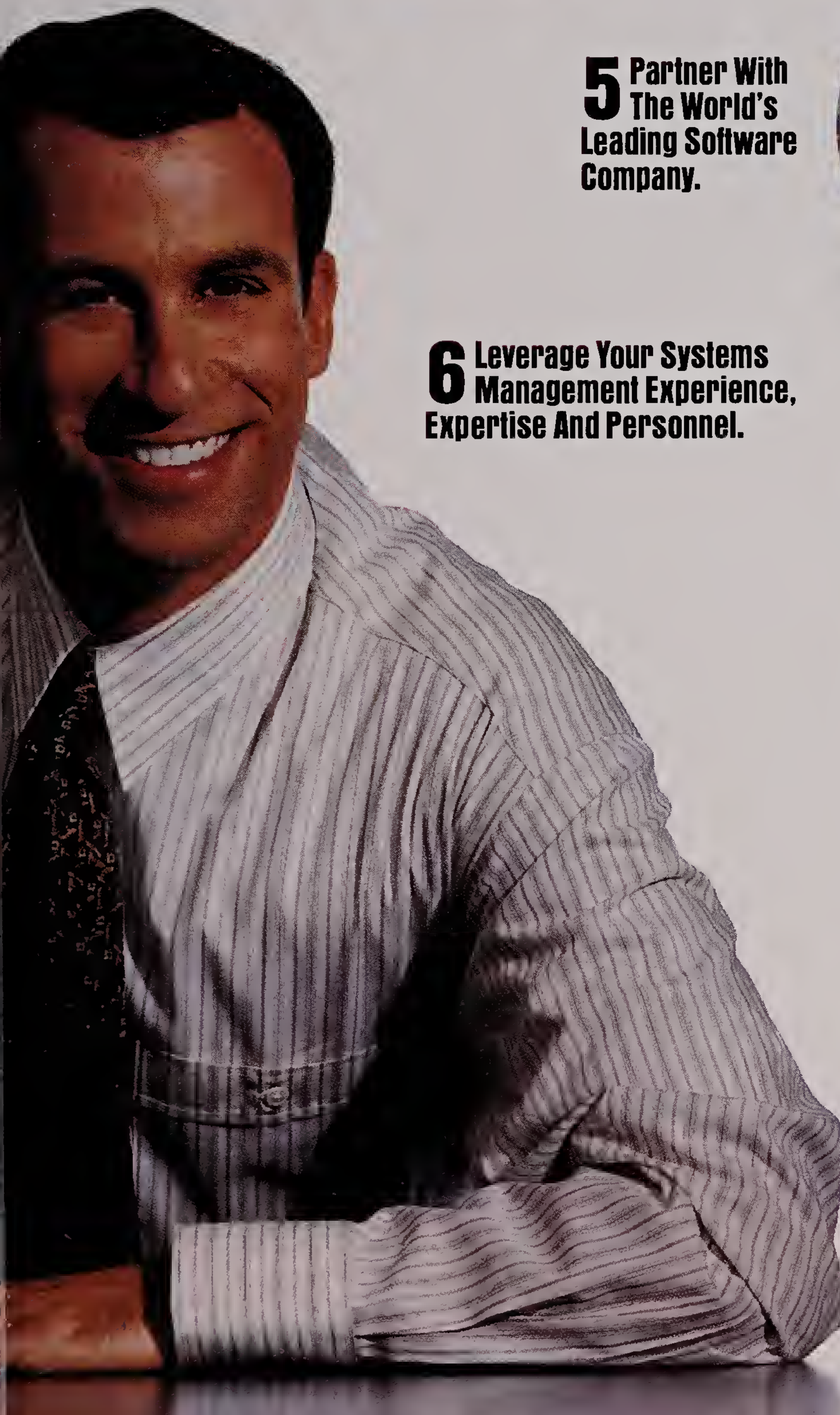

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> *"It's a good way to keep up not only with the technology but with what the vendors are actually doing, as opposed to what they say they're doing."*
>
> –JOHN LEHMAN

working support and cooperating with state government and with the K-12 educational community to share resources.

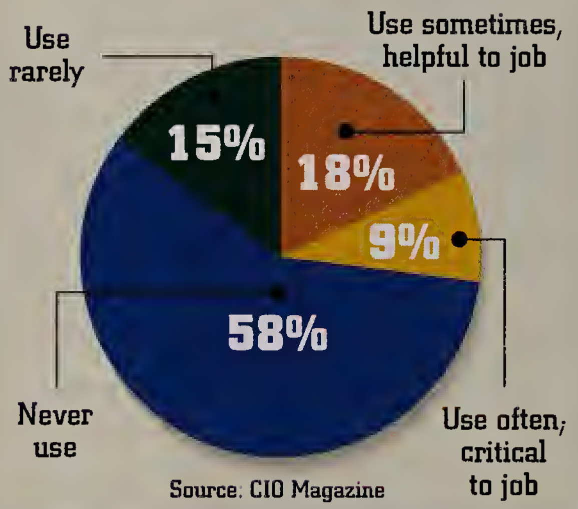
While many of the applications Lehman cites are typical of academic institutions, the University of Alaska needs them more than most. The university has faculty, staff and students spread across 2,000 miles, making distance learning a priority. And with the typical student 27 years old and employed, faculty must be able to extend office hours and pass assignments back and forth with those who can't attend class.

IS has had plenty of opportunities to use the Net as well. Because money is tight, for example, it takes full advantage of public-domain software. Lehman used the Net to do extensive research before replacing an IBM MVS system with Unix earlier this year, gleaning information from both vendors and users. And he participates regularly in discussion groups devoted to a variety of hardware and software platforms.

How CIOs Are Using the Internet

While almost half of our respondents view the information highway as a potentially useful or critical technology, nearly three-quarters rarely or never use the Internet in their jobs at this time.

Percentage of 235 Respondents



Source: CIO Magazine

"It's a good way to keep up not only with the technology but with what the vendors are actually doing, as opposed to what they say they're doing," says Lehman. "Very often I've found that I know about new developments long before our local representatives do. I'll call the Digital representative in Anchorage with questions about products he doesn't even know Digital has."

Summa International Inc.

Silver Spring, Md.

Information-systems architect Summa International is a self-styled virtual company. Individuals or groups of employees based anywhere from Los Angeles to Amsterdam may labor independently one day and join forces for a project the next. Partners come and go; geographic sites are increasingly far-flung. In such an environment, "if we didn't have electronic communication, it would be awful," says Edward Stull, the company's vice president of technology.

Stull uses the Internet six or seven times a day—sometimes he's on it almost continually. When he spoke with *CIO*, he was busy processing batches of documents that had just come in from Boston, Los Angeles and Australia. "Paperwise, those documents are something like half an inch thick," he says—too much to fax efficiently or reliably. In fact, if Summa didn't have access to the Internet, it probably would be sending disks back and forth via an overnight service. "But there's an expense associated with that—particularly when it's international," Stull points out. "And with the time difference, it can be very ineffective."

As a prolific developer of object-oriented software, Summa routinely makes its products available on the Net for comments and criticisms—a strategy that has worked very well, says Stull. He is also an enthusiastic user of freeware, which many companies put out for the sake of advertisement. For example, he recently downloaded the E-mail handling system Eudora and found it so impressive that he intends to go out and buy the commercial version. This, he believes, is the distribution model of the future. "As software becomes available on the information highway, people aren't going to be running down to Egghead to buy it anymore," Stull says. "It's just going to be there, and all you have to do is use it."

Foreign Service Institute

U.S. Department of State
Arlington, Va.

Prior to getting on the Internet earlier this year, the Foreign Service Institute—which trains everyone from clerks to ambassadors for work overseas—relied on the State Department's network to communicate electronically

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with its constituents. But there was a problem: The DOS network reaches 60 countries, while the Foreign Service has posts in approximately 160.

> "*Sometimes a vendor will say, 'Oh, we can do that,' and then six months later, they say, 'Oh, no, we didn't mean that.' But if I've got it on E-mail, I can say, 'Here's your message. Here's what you said.'* "
>
> – Cliff Pettit

Now the Institute has a quick and relatively easy means of communicating with personnel stationed from Chad to Taiwan. "We're able to tell new foreign-service officers before they go off to Central Africa that they're not going to be isolated," says Information Resources Manager Jim Davidson. He estimates that about a quarter of his messages now come from Internet E-mail; many of them he would not have received at all without it.

Closer to home, the Institute's acquisitions division is working on a system to put out requests for bids on the Internet, which Davidson says will speed that process and reduce paperwork considerably. And the Net has made it easier for the Institute to retrieve information on subjects like rare languages from a multitude of research facilities. "We have a lot of ex-professors here who know where to go if they can get on the Internet," says Davidson. "It's made it easier to provide the information for them."

Abekas Video Systems Inc.

Redwood City, Calif.

If you're a fan of TV's *Lois and Clark* or have been to many Hollywood blockbusters, you've probably seen the handiwork of Abekas Video, a post-production video-equipment manufacturer that specializes in special-effects hardware. The company, a subsidiary of Carlton Communications PLC, shares an engineering application with a sister organization in England, and IS Manager Cliff Pettit has found it cost-effective to transfer the software back and forth over the Internet at the end of each business day. "Instead of eight hours of use, we get 16 hours, which is important because the licensing is extremely expensive," says Pettit.

Prior to getting on the Internet less than a year ago, Abekas relied on a 9.6Kbps dial-up connection to send documents, and that was both slow and costly. The Internet has reduced transfer time from a half-hour each way to a few minutes and is significantly cheaper, says Pettit. As the company expands internationally, he believes the Net can also become a tool for global inventory management.

Pettit says he prefers communicating with vendors over the Internet because it is more efficient than the telephone and creates an electronic "paper" trail. "Sometimes a vendor will say, 'Oh, we can do that,' and

CLIFF PETTIT BELIEVES THE NET CAN BECOME A TOOL FOR GLOBAL INVENTORY MANAGEMENT.

PHOTO BY ERIC MILLETTE

A definition of scalable computing:

"The ability of a system to expand application execution in a near linear fashion as a function of added CPU components, properly balanced with I/O controllers and devices, provided that memory access and bus bandwidth capacity are sufficient to prevent excessive time-outs and queuing inefficiencies for stacked job streams where metrics for scalability generally employ network-connected terminal devices or simulators, although it may alternatively employ multiple intelligent clients providing for distribution of workload between client and server." ~ *The competition*

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then six months later, they say, 'Oh, no, we didn't mean that,' " he explains. "But if I've got it on E-mail, I can say, 'Here's your message. Here's what you said.' "

So far, only a few of Abekas's vendors are on the Net, including Oracle Corp., Digital Equipment Corp. and Sybase Inc. "If vendors are connected, I put them a notch above the others, although whether they're really going to provide me better service is questionable," says Pettit. "For most of them, the sales force is connected, but the service department is not. That doesn't give you a real warm, fuzzy feeling."

> "*Just about every product we have will need a patch of some kind, and it's always well-advertised on Usenet.*"
>
> – Craig Mason

Great-West Life Assurance Co.

Englewood, Colo.

A few years ago, when insurance company Great-West Life was experiencing software problems, Craig Mason would have to raise the appropriate person by phone and then wait seven to 10 working days to receive a patch through regular mail. Now that the company is active on the Net, Mason receives those patches rapidly through E-mail or retrieves them himself electronically from one of Sun Microsystems Inc.'s sites.

"Just about every product we have will need a patch of some kind, and it's always well-advertised on Usenet," says Mason, associate manager of distributed systems operations, who conducts most of his other interaction with Sun over the Net as well. What with vendor transactions and technical support for Great-West's 50 U.S. and Canadian offices, Mason estimates he spends 90 minutes a day on E-mail alone.

He also uses the Net to solicit technical help, most recently when he noted some bugs in Sun's Selectmail. He mentioned the problem in a newsgroup and received a response from a programmer in the United Kingdom who had actually worked on the product. "He sent me a copy of the next release—he had gotten his hands on it early—and sure enough, it fixed many of my problems," says Mason. "What's interesting is that when I called the normal support lines, they were not aware that the next release was even available."

A recent query about viruses elicited a response from one of that field's preeminent researchers, who is currently living in Hamburg. "It's amazing to me that I'm getting these problems solved—and by folks who live in Germany!" says Mason.

Currently, only a handful of Great-West employees use the Internet, but Mason hopes to expand that substantially in '95. "Once folks realize that they can go out there and do the types of things that the Gartner Group does for a fee, I think it'll catch on," he says.

Inland Steel Co.

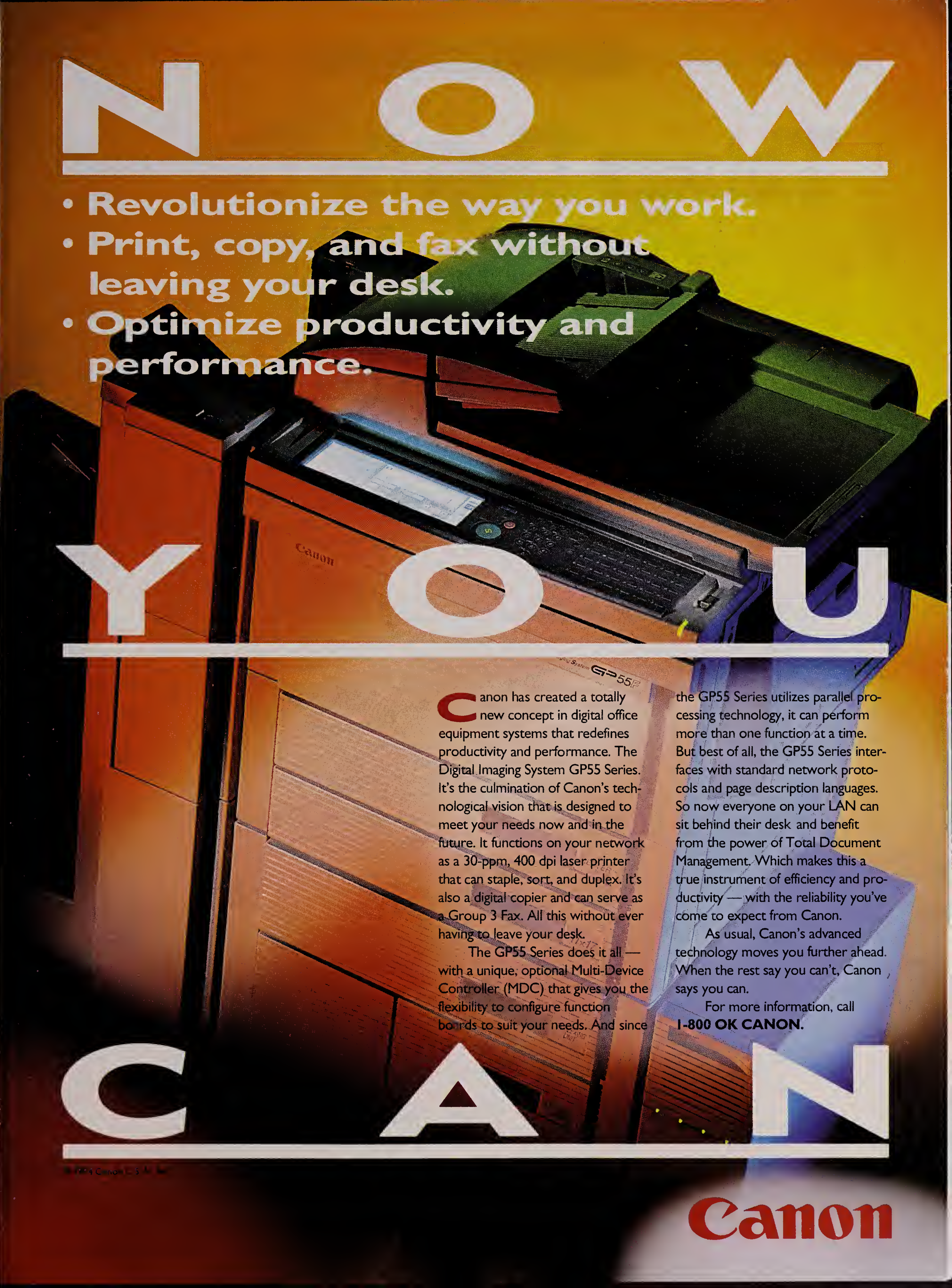
East Chicago, Ind.

For James Deck, the most amazing thing about the Internet is its encyclopedic nature. No matter how arcane the subject, there are experts out there, and all it takes is a little diligence to find them.

As section manager for research computing at Inland Steel, Deck supports a group of engineers who need to know about stuff like applying fractals to surface analysis, a subject they found usefully addressed in an unpublished paper stored electronically at a university in Finland. "You have to learn to navigate around," says Deck. "As one guy here put it, the diamonds aren't just lying on top of the ground. You've got to do some mining."

Inland's engineers use the Internet regularly to participate in technical discussions, an activity Deck believes is a supplement to, but not a substitute for, attending professional conferences. The computer group also consults the Net for support, suggestions and free software ("as jaded as I've become, I still felt a sort of thrill as I used my terminal to pull it to our site in just a few moments," says Deck of a program the company retrieved recently from Cambridge University in England).

Deck also points out that the Net can be an important tool for supporting employee morale. He tells the story of an Indian engineer whose new bride had to return to that country for an extended period: The couple used the Internet to keep in touch. And when another employee was diagnosed with multiple sclerosis, he found comfort in an Internet support group. "That's been invaluable to him," says Deck. "It has certainly raised his spirits." CIO



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Things That Go Bump On the Net

Only abstinence offers complete protection from vandalism, viruses and other hazards of doing business on the Internet. But experts contend that the potential payoff of going online makes it worth confronting those fears.

BY ANNE STUART

IT WAS INFORMATION TECHNOLOGY'S worst nightmare.

Within minutes, a destructive computer "worm" raced across the Internet, invading organizations nationwide, causing their computers to founder, freeze and fail. As system after system crashed, some users blamed terrorism or sabotage. Actually, the devastation stemmed from a program by a Cornell University undergraduate, Robert Morris, who later characterized the widespread devastation as an accident caused by a flawed calculation. The affected organizations recovered, tightening security to immunize themselves against future infection and implementing sophisticated virus-detection and tracking programs. But in the same way that homeowners never again feel entirely safe after a burglary, the 1988 Morris case scarred the psyche of many organizations on the Internet and, years later, still makes those who haven't connected wonder whether the benefits are worth the risks.

Information Highway
A CIO's Guide To The

Consultants say that among all the fears about doing business on the Internet—and there are many—security-related issues top everybody's list. An informal survey of *CIO* readers shows IS executives are no exception. Nearly 85 percent ranked security or viruses or both as their biggest concerns (see chart, Page 66). Others were more worried about connection costs and whether productivity will nose-dive as employees spend work time venting their opinions in newsgroups or shopping at the electronic mall.

Analysts say the concerns are valid. But they also say that, in many cases, the degree of danger is exaggerated. Viruses and vandalism remain problematic, but the Morris case stands alone in its impact. True instances of corporate espionage remain unusual; break-ins generally involve hackers more interested in making mischief or testing their skills than stealing trade secrets.

Security issues stem from the nature of the network itself. The Internet and its predecessor, ARPANET, were designed to let a relatively small group of researchers and government officials share information. Thus its architects designed the Internet for maximum openness, in contrast to the later, more security-conscious wide area networks and online services. Few anticipated the Net's explosion into a global community and the resulting security headaches.

Net veterans say companies should simply take the same philosophy toward securing their electronic doorways as they

ILLUSTRATION BY PHIL MARDEN

do with physical entries to their organizations.

Still, there's only one 100 percent foolproof way to shield systems connected to the Internet from unauthorized access, imported viruses or the theft, loss or damage of information. "The best security is not having a connection," says Mary J. Cronin, author of *Doing Business on the Internet* (Van Nostrand Reinhold Co., 1994). "But that's not an option anymore."

> "*You implement as many different aspects of what's out there to provide as much security as you feel you need, based on the value of your data and the cost if the machines are down.*"
>
> –KEVIN CAREY

Rand T. Lennox, senior vice president and CIO at the University Hospitals of Cleveland, agrees wholeheartedly with the first part of that statement. But in his industry, he says, the second doesn't apply. At least not yet. "There are a lot of valid uses for the Internet, but the real-time business of patient care is not one of them," he says.

Currently, Cleveland medical-center personnel can use a one-way outgoing Internet connection for research. But nobody outside can dial in, and that won't change until Lennox is satisfied that hackers can never obtain patient records. "If they can find a way to crack the Department of Defense system, what makes me think I can keep them out?" he says. "Risking patient confidentiality is not a risk I'm willing to take. Until we have an absolute way to prevent that, we won't open the door."

While there's no money-back security guarantee, a variety of options come pretty close. As Cronin puts it, you can't control access to the Internet, but there are ways to control access to an Internet connection.

The first step is to determine how much security the organization really needs. Typically, the first response is, "Everything that's available." But consultants suggest taking a second look before making the final decision, as heavy fortification can be unduly expensive and slow down the systems.

"You implement as many different aspects of what's out there to provide as much security as you feel you need, based on the value of your data and the cost if the machines are down," says Kevin Carey, an Internet security consultant for Digital Equipment Corp. of Maynard, Mass.

The highest-level security solution makes sense for technology firms with proprietary data, institutions relying on electronic transactions and companies with reservations systems that may lose thousands of dollars for every minute of downtime. Other organizations with information that is less vulnerable or less critical may be able to get by with lighter armor.

Among the best-known high-level security measures is "firewall" technology, which, like the construction term for which it is named, contains a disaster to keep it from spreading. Firewalls typically work by isolating the Internet-connected computer from the rest of the system, using a combination of hardware and software to build what Dave Grissom, director of business development for Cohesive Systems of San Mateo, Calif., calls "the demilitarized zone." This works like an air lock, preventing inside systems from coming directly in contact with the outside world.

Keeping those worlds separate is a critical issue for Steven Steinbrecher, IS director for California's San Joaquin County. "We have a lot of information about people's health, their welfare status, their criminal records," Steinbrecher says. In addition, he estimates the county loses $30,000 to $40,000 per hour every time systems crash. For both reasons, he says, "I have extremely rigid policies about firewalling my systems both ways, outbound as well as inbound."

But even firewalls aren't foolproof. "Firewalls control access, but they don't control content," Carey says. For instance, a firewall won't keep employees from accidentally importing viruses along with files.

For that reason, most consultants recommend a broader approach to security, including employee-awareness training. Other security options companies may wish to consider include a satellite system exclusively for Internet use, virus-scanning software, controls on access, data or file encryption, redundant networks and "tracking programs" that can trace a break-in back to its source. While state-of-the-art firewalls remain the most powerful preventive measure, some organizations may find a simpler firewall or a combination of other options sufficient for their needs. On the other hand, even those with firewalls may wish to invest in the extra protection afforded by the less expensive options.

For Paul Anders, security questions make the Internet more risky than it's worth, at least for now. "The more doors that you have into a facility, the more chances there are that something's going to happen," says the senior vice president of Tropical Sportswear International in Tampa, Fla.

But there's another business reason Anders' apparel-manufacturing company isn't on the Net yet. "A lot of what I see with the Internet is hype," he says. "I have not really seen it used significantly yet for business."

Paul Rack, senior vice president of Document Processing Systems Inc. in Farmington Hills, Mich., expresses similar skepticism. "So far, I haven't seen anybody use it for anything that was all that worthwhile," says Rack, whose company prepares closing documents for mortgage brokers. Rack's primary objection: He believes an Internet business connection would lead to information overload and loss of productivity.

To illustrate, Rack relates the tale of another company whose employees spent a couple of hours each day sifting through electronic messages—and that was just from internal E-mail. He's unswayed by arguments about the quantity of information available on the Internet, noting that it can be difficult to find the right resource: "If you walk into a library and you can't find the one book you want, who cares how many are there?" Rack says his company gets all the data and information it needs in other ways, primarily through dedicated connections with its clients.

Internet Security Providers

A sampling of vendors that offer Internet security products and services:

Advanced Network and Services Inc.
E-mail: *info@ans.net*
Phone: 800 456-8267

Cohesive Systems
E-mail: *mpalmer@cohesive.com*
Phone: 415 574-3500

Digital Equipment Corp. Internet Security Services
E-mail: *seal@pa.dec.com*
Phone: 800 832-6277

Trusted Information Systems Inc.
E-mail: *tis@tis.com*
Phone: 301 854-6889

General Foods USA's Vice President of MIS Jim Cook, whose company uses an extensive internal E-mail system and EDI gateways to communicate with vendors and customers, is among those wondering whether the productivity paradox applies to business use of the Internet. "There's so much nonbusiness stuff on the Internet that you have to wonder if people are getting their jobs done," he says. "If you have the Internet there, it seems to be a temptation."

It's true that full Internet access may open the door to employees sending personal E-mail, downloading pornographic files or whiling away work hours in conferences with names such as *alt.fan.bill-gates* or *alt.tv.seinfeld*. But those are management issues, not technological ones. Executives can, of course, use technology to address them by restricting certain activities; for example, letting everyone use Internet E-mail but allowing only select employees to participate in newsgroups. Or they can

monitor incoming and outgoing transmissions. Or they can set policies on private use, just as most already do for personal use of telephones, photocopiers, vehicles and other company equipment.

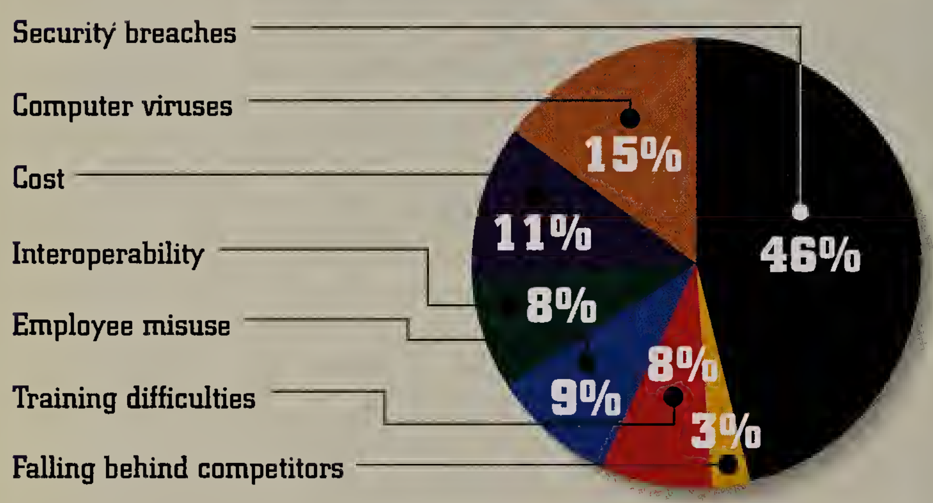
"If you hold people accountable for what they do and they get their work done, should they then not spend time on the Net?" asks Larry Merrick, vice president of MIS at Chicago-based Encyclopædia Britannica, where employees use the Internet extensively for E-mail, customer service, educational outreach and other efforts, such as the company's new product, Britannica Online (see related article on Page 36). "Part of it has to be trust of your employees."

And play may bring work-related benefits. "Be flexible," recommends Michael Bauer, president of The Internet Group, a Pittsburgh-based firm that provides Internet publishing systems and services. Particularly at the beginning, give employees time to learn their way around. "They're learning how to explore, developing a skill set," he says. Some companies tell employees to keep their Internet use business-related during work hours but, as a job benefit, allow them to navigate the Net freely on their own time.

What Worries CIOs About the Information Highway

When asked to name their number-one concern about using the information highway, 108 out of 235 respondents cited security breaches; only a third as many mentioned viruses, the next-most common answer. The message of competitive urgency many pundits have tried to convey does not appear to be taking hold; more than one quarter of respondents cited fear of falling behind competitors as their least-pressing concern.

Percentage of 235 Respondents



Source: CIO Magazine

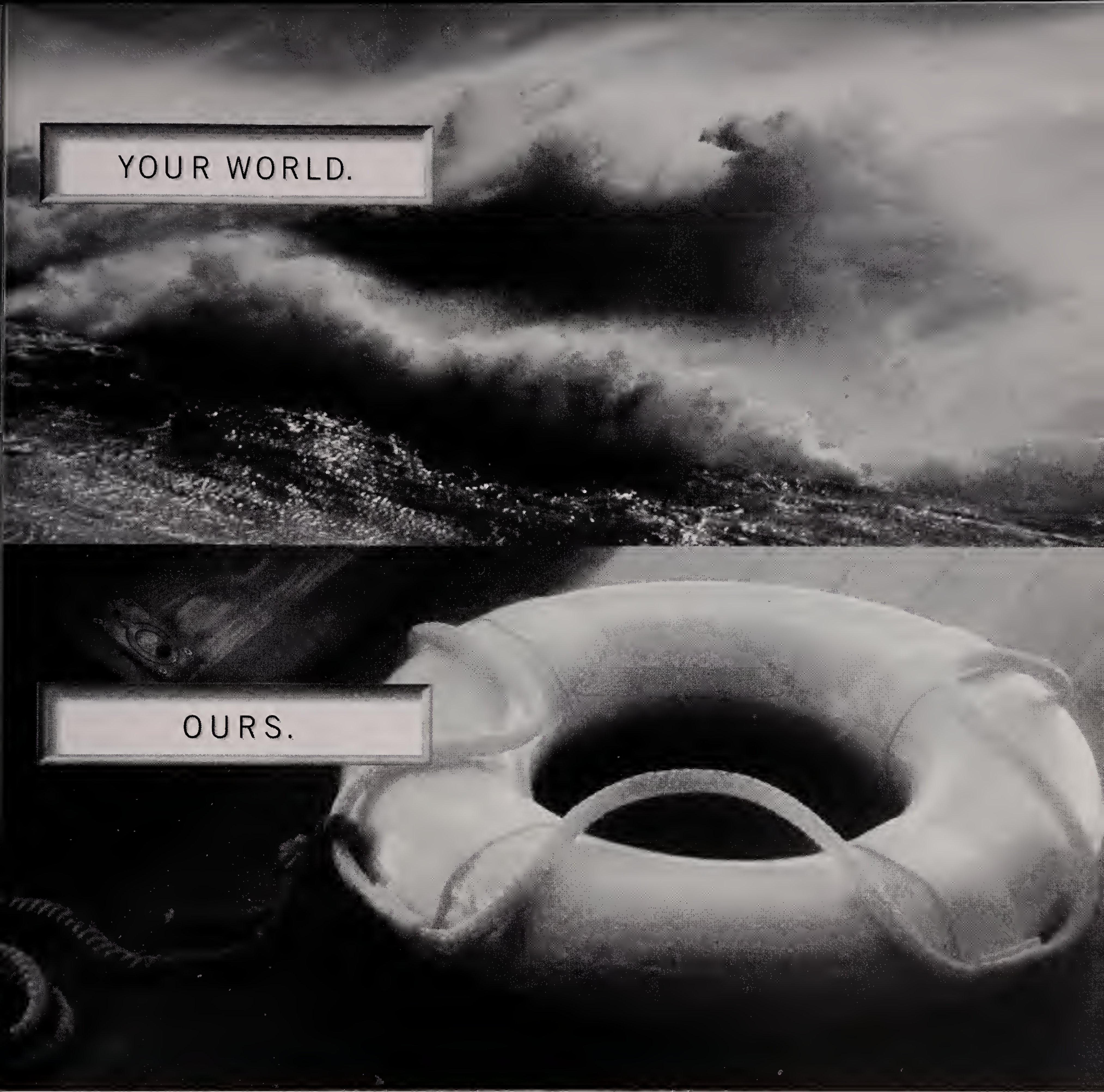
The extra time employees spend online usually costs the company little or nothing. Other Internet costs, however, remain among CIOs' top concerns about the Internet, largely because of wildly varying estimates on startup, service and maintenance expenses.

For a very small business, a connection can run as little as $20 per month per person for individual dial-up accounts for E-mail, research and file uploads and downloads, Bauer says. But medium to large companies can expect to spend $5,000 to $50,000 in startup costs for computers, communications equipment, consulting and services. The lower end of that range will buy a dedicated PC; the higher end will purchase a state-of-the-art Internet server. Beyond that, companies can expect to spend $3,000 to $30,000 annually—depending on the company's size and its connection options—for service, maintenance and software. Extra security measures can cost thousands more.

To decide whether an Internet connection is worth the expense, Bauer says, executives need to develop an Internet strategy by considering some key questions: "Why are you connecting? What specific benefits can each department in your company accrue, and how can you measure them? What are the trade-offs in cost and benefits?" Organizations also need to take a hard look at risks but should realize that properly placed security investments can help reduce and manage those threats.

And they should realize that, as this brave new form of communication continues evolving, so will the issues and problems its users must face. For instance, over the next year or two, managers can expect to hear plenty about the legal questions of doing business on the Internet.

Mikki Barry, counsel to the newly formed Internet Business Association in Reston, Va., cites in particular a host of recent precedent-setting cases on questions of jurisdiction, copyright, trademark use, free speech, obscenity and other legal issues. "We're suddenly stepping into a worldwide arena that hasn't been tested yet," she says. But she adds that, all things considered, "the Internet has been made easier than ever, and it's time for businesses to climb aboard." CIO



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A Fine Forecast

The NII is likely to transform the ways in which companies create and deliver goods and services. Here's a look at what the future might bring.

ARE YOU ARE STUCK THINKING of the Internet as simply another E-mail or information-retrieval technology, as most of the readers we queried in our Internet survey seem to be? Well, think again. The development of the information infrastructure will change your business.

Senior Writer E.B. Baatz asked four respected technology experts to share their educated guesses on likely developments for the online future. What follows are their predictions—presented as fictionalized case studies—for banking, manufacturing, health care and retailing.

Our futurists were asked to limit themselves to a 10-year time horizon and 500 words apiece. Although the imaginary CIOs in these vignettes turn their information-highway dreams into grand successes much more quickly than is likely to happen in real life, some of the technology applications they describe are already being explored. Indeed, sometimes it's tough to tell what's fiction and what's fact, which says something about how fast the future is hurtling toward us.

ILLUSTRATION BY BETHANY GULLY

Banking: Smart Money Talks

BURNED IN THE '80S BY OVERLY optimistic predictions for PC-based home banking, CIO James Richman is initially reluctant to get Green Bank Corp. fully positioned to conduct business on the Internet. Like his cautious fellow bankers, Richman has put his company's money on telephone-based banking services and concentrated his strategic planning on interactive TV and smart cards.

Green Bank begins creating "smart money" for customers—funds that automatically flow to the highest-return investments or find the lowest-rate debt.

But Richman worries. In 1994 he observes some disturbing developments:

- Poised to become the technology-based bank of the future, Intuit Inc. (the maker of Quicken software) announces a private online financial service spanning banking, investment and credit-card services.
- In a move that further threatens existing banking structures, Microsoft Corp. puts its clout behind Intuit, acquiring the company in October of that year.
- The status quo is further shaken as other nontraditional players move into the market, including credit-card companies pushing for debit cards and discount brokerage Charles Schwab, which introduces Street Smart software for making transactions and checking stock quotes online.

After a strategy meeting in mid-1995, Green Bank decides to compete vigorously in the emerging networked financial-services business. It acquires InterBank Software Corp., a small startup company that writes software allowing bank customers to check their account balances over the Internet. This new service—which the bank names GreenNet—provides the backbone for Green Bank's online future.

With more than 30 million home PCs, the market looks ripe for the introduction of GreenNet. Green Bank hopes that by appealing to high-income consumers, the service will yield more-diverse sales opportunities. GreenNet is a hit, and with the advent of a secure version of Mosaic and Internet-authentication capability, Green Bank extends its services to include other financial transactions as well. An online service that helps first-time home buyers find the most affordable mortgages quickly becomes one of the most popular.

Despite the success of GreenNet, within a few years the bank gets into trouble again. When customers paid bills using the old paper system, the bank profited from "float" (the processing time it takes the bank to credit a customer's account). But now that bills are paid just-in-time over GreenNet, the company is losing money. Also, even though the bank spends less on electronic transactions than it did on paper ones, the failure to pull the plug on brick-and-mortar branches keeps costs high.

By the end of the decade, the bank's executives decide that a more radical approach is needed. By harnessing computing power and speed on its worldwide computer networks, and with the strategic vision of Richman, Green Bank begins creating "smart money" for its customers—funds that automatically flow to the highest-return investments or find the lowest-rate debt. The network also automatically moves money based on a consumer's balances, spending patterns and investment needs.

More than a commercial bank, by the year 2005 Green Bank is renamed InfoMoney Corp. Old automatic teller machines are sold to the Postal Service and other businesses that have developed kiosk-style customer services. Branch offices are transformed into sales offices and hardware-repair shops. And CIO Richman retires a very rich man indeed.

William M. Bluestein is a senior analyst at Forrester Research Inc.'s People and Technology Strategies service in Cambridge, Mass. His complete Smart Money *report was published by Forrester in August 1994. Bluestein can be reached by fax at 617 868-0577 or by E-mail at* wbluestein@forrester.com.

1995

Green Bank Corp. acquires InterBank Software for a fast start on the Net

1996

CIO Richman introduces GreenNet to 30 million home PCs

1998

No float! Green Bank's losses mount to record levels

2000

Smart-money service begins; funds flow to highest return

2003

ATMs are sold off, and branch offices become sales offices

2005

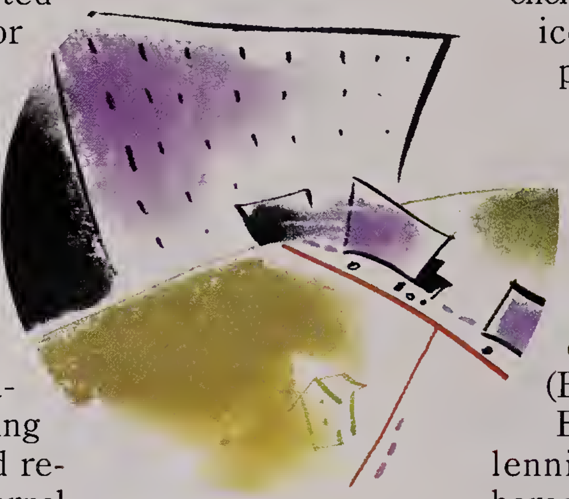
Green Bank is renamed InfoMoney Corp.; CIO Richman retires a millionaire

Manufacturing: Gear Today, Gone Tomorrow

IN 1994, RAPID PROTOTYPING IS A JOKE at Big Gear Corp. Building a prototype for a new gear takes months of work—establishing terms and conditions with computer-aided design units, validating supplier capabilities and sending drawings and clarifications back and forth by mail. An angry CEO charges CIO Ernest Riveter to solve the problem with technology.

Riveter's first stop is his local Department of Commerce Manufacturing Technology Center. There he finds educational material created by Agile Infrastructure for Manufacturing Systems (AIMS)—a consortium of manufacturers devoted to providing flexible machining services to each other over the Internet—and gets his own Internet software starter kit.

By 1996, Big Gear's machine designers begin using multimedia E-mail to send requests to the company's internal prototyping shop as well as to other firms on the network. In less than a minute, Big Gear receives back data sheets detailing each shop's capabilities, costs and availability. Big Gear's designers aren't intimidated by the online "paperwork," because it looks like a typical entry in the Thomas Register (the big Green Book of manufacturers' purchasing data), complete with charts and pictures but with up-to-the-minute data.



Real-time electronic conferencing enables the designer and the manufacturers to run applications simultaneously and share data across platforms. Problems that used to require a plane trip across the country can now be solved online.

One designer selects two shops that have been precertified for machining magnesium to .005 tolerances and have capacity immediately available. Real-time electronic conferencing enables the designer and the manufacturers to run applications simultaneously and share data across platforms. Problems that used to require a plane trip across the country can now be solved online in a day.

Others within the company begin clamoring for online access. Riveter is pleased because, for the investment to pay off, he needs to hook up all departments including the shop floor, quality assurance, planning and purchasing. Soon, Big Gear becomes certified as a service vendor for manufacturers that want to outsource their prototyping work. The information infrastructure also makes it easier for Big Gear factories to accept others' outsourcing contracts, helping the company balance its production runs and keep busy during slack times.

Big Gear begins competing for business by advertising in the manufacturing Yellow Pages and running classified ads on the information highway. A customer clicks on Big Gear's distinctive icon and receives catalog pages and custom order forms. Engineers access design and cost quotes via hypertext menus and no longer have to waste time learning idiosyncratic graphical interfaces or electronic data interchange (EDI) transaction sets.

But by the end of the millennium, Riveter is growing bored. So he quits Big Gear to start his own third-party brokerage service, Riveter Online Inc., which administers bids for all gear manufacturers. His 5 percent fee is considered a bargain since the entire bidding process takes only a few hours to complete, eliminating procurement backlogs. His customers' production costs are reduced nearly 10 percent because posting winning bids drives down market prices. Riveter Online also provides online access to information on the latest experimental fabrication processes.

His brokerage business thriving, in 2005 Riveter acquires Big Gear and, in retribution for that angry tirade 10 years ago, fires his old boss.

Jay M. Tenenbaum is CEO of Enterprise Integration Technologies of Menlo Park, Calif., and a founder of CommerceNet. He is nationally recognized for developing information-infrastructure technologies for electronic commerce, concurrent engineering and integrated manufacturing. He can be reached by fax at 415 617-8019 or by E-mail at jmt@eit.com.

1995

Big Gear CIO Riveter attends Commerce Department AIMS educational seminar

1996

Machine designers use E-mail and standard forms to get bids

1998

The company's first hypertext Yellow Pages ad appears on the Internet

2000

Boredom! Riveter quits to start up Riveter Online Inc.

2003

Average gear-production costs drop 10 percent thanks to online bidding

2005

Riveter buys Big Gear and fires old boss

Health Care: Putting Your Health Online

THE INFORMATION SYSTEMS STAFF at General Hospital has worked hard to automate billing and patient admitting, but CIO Diane Cutter has more in mind than just cutting costs. The challenge for the institution in 1995: Link all of General Hospital's caregivers over a single computerized network and provide access to the Internet.

Home PCs wired to GetwellNet provide patients with online access to practitioners and answers to medical questions—helping to speed patient assessment, treatment and recovery. Special probes monitor blood pressure and pulse, allowing a nurse at General Hospital to conduct examinations.

Knowing that people sometimes resist new technology, Cutter starts off small by hooking up the oncology department to the National Cancer Institute's CancerNet, which provides information about state-of-the-art therapy and clinical-treatment trials.

By early in 1996, word spreads that the hospital's network, now dubbed GetwellNet, works. Soon, it enables all staff doctors to sort through the vast biomedical literature and find the most medically appropriate and cost-effective treatments.

After spending several years on a national panel to devise a uniform health-care industry coding system, Cutter establishes a complete record of every General Hospital patient's diagnosis, treatment and outcomes.

By the year 2000, the federal government enacts national privacy laws. These supersede the patchwork of state laws, safeguard the confidentiality of patient records and set the stage for construction of a national health database. General Hospital's records are integrated with the personal medical records that exist for all patients in a comprehensive database on the National Information Infrastructure (NII).

Now, every time a health-care consumer moves, his medical records move with him (encrypted, of course), ensuring continuity of care and maybe even saving his life in an emergency. When the patient data is aggregated (with identifiers removed), the system provides doctors and consumers with information about what treatments and technologies work best under specific clinical conditions and which health-care providers and plans provide the best care. The system also helps doctors reduce unnecessary testing and find the least-expensive drugs, thereby cutting costs.

A few years later, the network proves its mettle by helping the Centers for Disease Control track a virulent new superbug that attacks two patients at General Hospital. Quick detection of the geographic spread of the disease helps the hospital contain the crisis, locate the closest source for the vaccine and keep people in the community who are at risk informed.

Cutter becomes active outside the hospital walls too. Home PCs wired to GetwellNet provide patients with online access to practitioners and answers to medical questions—helping to speed patient assessment, treatment and recovery. Special probes that monitor blood pressure and pulse can be attached to the PCs, allowing a nurse at General Hospital to conduct examinations through a high-resolution telecommunications viewer. National and community networks also empower patients to obtain information about health-care options.

Ten years after beginning the huge task of wiring her hospital into the NII, CIO Cutter retires to her remote family ranch in Montana where her home PC keeps her hooked up to the best medical care back at General Hospital.

J. Michael Fitzmaurice is director of the Office of Science and Data Development for the Agency for Health Care Policy and Research in Rockville, Md. His complete health-care report is available in NIST Publication 857. Fitzmaurice can be reached by fax at 301 594-2333 or by E-mail at mfitzmau@po5.ahcpr.gov.

1995

Doctors at General Hospital log onto GetwellNet

1996

Oncologists' success on CancerNet spreads the Internet word

1998

CIO Cutter joins national panel, devises universal medical coding system

2000

Congress passes national privacy laws; national database is built

2003

Emergency! A virulent new disease is stopped in its tracks

2005

Home PCs connect to GetwellNet; CIO Cutter retires to remote ranch

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1995

ShopMart management sees vision of online customized stores

1996

CIO Merchant begins arduous task of building complex databases

1998

Designers create friendly front ends for "preference filters"

2000

Overnight success! ShopMart's ElectronicMart debuts

2003

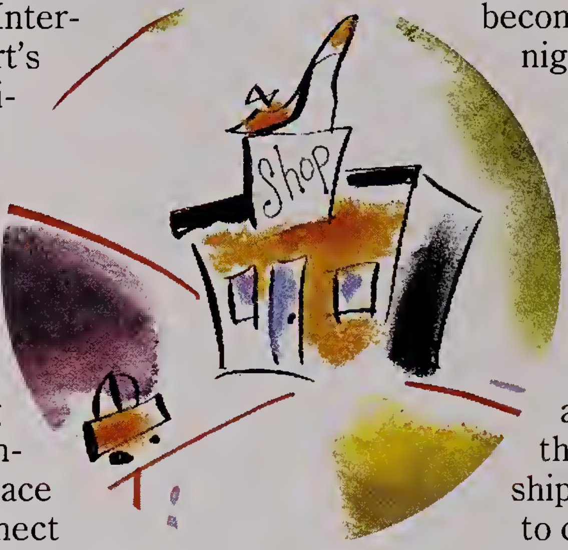
Intelligent-agent software is tweaked for better service, more savings

2005

ElectronicMart goes global; CIO Merchant is named CEO

Retailing: Surfing for Shoppers

PER-STORE PROFITS HAVE PLUMMETED, and ShopMart has made all the cuts it can. Deciding to grow their way out of trouble, in 1995 senior management hires the mild-mannered but brilliant Price Merchant as CIO. His vision: to develop a new service of online, customized, "virtual" stores offering merchandise that matches individual customers' buying histories.



Intelligent-agent technology searches for and assembles preferred items from Unix-based database servers in ShopMart distribution centers and stores, building customized, virtual stores within seconds of customers signing on.

Though specialized shopping services have existed on the Internet for some time, ShopMart's goal is to develop a three-dimensional store view, providing its customers with drill-down, per-item visualization capabilities.

In 1996, Merchant's staff begins the arduous task of building an object-oriented database linking product images, shelf management, and price and space allocation. They interconnect the product database with a multidimensional customer database that includes information on buying frequency and purchase and credit histories for its current and potential customers.

Next, the software designers create a graphical front end that enables customers to activate network links with preferred credit and debit payment services. Merchant introduces technology that lets customers construct their own knowledgeable "preference filters" by clicking on product and brand likes and dislikes; each individual customer's filter is turned on automatically every time he or she logs onto the network.

Intelligent-agent technology searches for and assembles preferred items from Unix-based database servers in ShopMart distribution centers and stores, building customized, virtual stores within seconds of customers signing on.

ShopMart announces the nationwide introduction of ElectronicMart in the year 2000. As a promotion, ShopMart inks a deal with Gateway 2000 to lease its PCs to every household located within 25 to 50 miles of existing ShopMart stores. ShopMart targets households that take periodic day-long shopping trips and that have been cited in consumer surveys as big spenders at certain discount retail chain stores. Each customer is given a $50 gift certificate to Delphi Internet Services; a long-term, interest-free lease from Gateway 2000; and free Internet education classes and online help from ShopMart. ElectronicMart becomes a success almost overnight.

Tweaking the system to achieve even more savings and better service, Merchant programs the intelligent-agent technology to look for preferred merchandise at the best price throughout the chain. The agent notifies suppliers on the network to immediately ship out-of-stock items directly to customers. To expedite delivery, the agent is also programmed to recommend the best and most economical transportation carriers based on the size and weight of the package, delivery logistics, local zoning ordinances, day of week and time of day.

Customer loyalty grows. ShopMart's foray into online shopping quickly goes international and emerges as the standard for online retailing. Within three years, ShopMart's electronic-shopping sales surpass the sales of the company's store division.

In 2005, ShopMart names Merchant chief executive officer. The new CEO continues his mission, wiring his global-village stores in the remote four corners of the Earth. CIO

Thomas H. Friedman is publisher of Retail Systems Alert, *a monthly newsletter based in Newton, Mass. A widely cited authority on retail systems and computing strategies, Friedman also runs the annual Retail Systems trade show. He can be reached by fax at 617 527-8102 or by E-mail at* tfriedman@delphi.com.

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Internet Library

Books about the Internet abound. Here's a guide to what should be on your bookshelf—and what to recommend to everyone else in your company.

BY DANIEL P. DERN

When last I dared to check, I counted more than 150 books containing "Internet" or a related term such as Mosaic or Gopher in their titles. Dozens more have been written on associated topics, including TCP/IP and Unix. The challenge for organizations that want to make use of the Internet as a business tool or resource isn't finding Internet books, it's narrowing down the choices to fit in a single shopping cart.

This shopper's guide will help acquaint you with what's new and worthwhile on the Internet bookshelf, with an overview of the categories of books available and recommendations for what to buy for yourself, network/computer operations, the corporate library, developers and Internet users-to-be. It also points out comprehensive online bibliographies and explains what *not* to expect from any Internet book.

PHOTO BY RALPH MERCER

But first, some cautions and warnings: Many so-called "Internet user guides" are only for E-mail/Usenet and other batch-oriented users, or are provider-specific. Avoid these. Also, don't insist on books with software disks. Provisioning an entire organization is a different process from building a library.

Be suspicious of secondary sources for Internet information. Many books contain numerous, often surprising errors. Almost any printed list of resources is bound to be out of date. And finally, remember that there's a lot to know. Don't expect one book to cover *everything*—and don't expect to become the compleat Zen master of the Internet in a week.

Now let's go shopping.

Basics first: user guides and introductions. Start by stocking up on basic Internet user books and browse through these. Some will have a chapter or so on Internet history, terminology, concepts and "what you can do with the Internet." Some—but not all—of the user-oriented books include an overview of business applications, issues and opportunities.

You'll want a few of these for your shelf and more copies for your corporate library, training group and operations staff; many users will want their own. (Most publishers offer 20 to 45 percent discounts on bulk orders, and if you want 1,000 or more copies, you may be able to get special deals.)

The best-known and one of the two best-selling all-around Internet books is, of course, Ed Krol's *The Whole Internet User's Guide and Catalog* (O'Reilly & Associates Inc.). One of the first true Internet user guides, it covers the gamut of Internet tools and services and includes a resource directory, which is also available online. Aimed primarily at LAN-connected Unix users rather than total neophytes, this is a book people will expect to see on your shelves.

Also recommended: Paul Gilster's *The Internet Navigator* (John Wiley & Sons Inc.), now in its second edition. Gilster offers the best in-depth discussion and examples I've seen for using the leading Internet search-and-query tools such as Gopher, Wide Area Information Service (WAIS) and Veronica; his book is on my short list of recommendations.

The other well-known books for new users are *Zen and the Art of the Internet* by Brendan P. Kehoe (Prentice Hall) and Tracy LaQuey's *Internet Companion* (Addison-Wesley Publishing Co.). The former is basically Internet "Cliffs Notes" and assumes you "speak Unix"; the latter is a popular overview but isn't comprehensive enough to be the only book you'll need.

My personal favorite (hey, I'm its author...) is *The Internet Guide for New Users* (McGraw-Hill Inc.). It includes "Enough Unix to survive on the Internet" and does its best to help readers "think like Internauts," so they can do tasks and solve problems.

Internet Instant Reference by Paul E. Hoffman (Sybex Inc.) has good command summaries, *Everybody's Guide to the Internet* by Adam Gaffin (MIT Press) includes lots of good specific pointers, and *The Internet Passport* by Jonathan Kochmer (NorthWestNet) contains some of the best write-ups of Online Public Access Catalogs (OPACs) and libraries. Other well-received user guides include: *The Internet Complete Reference* by Harley Hahn and Rick Stout (Osborne/McGraw-Hill); *The Internet for Dummies* by John Levine and Carol Baroudi and *More Internet for Dummies* by John Levine and Margaret Levine Young (IDG Books, owned by *CIO*'s parent firm); and *Riding the Internet Highway* by Sharon Fisher, Steven Vaughan-Nichols and Rob Tidrow (New Riders Publishing).

For CIOs and managers: business and overview books. Now get some books with the words "Internet" and "business" in their titles—only three are actually out at press time, but expect half a dozen by early 1995. The most well known is Mary J. Cronin's *Doing Business on the Internet: How the Electronic Highway is Transforming American Companies* (Van Nostrand Reinhold Co.). The first edition is obviously geared toward people who are already Internet-savvy. It also makes conducting business on the Internet seem more complicated than it has become since the book was printed, but it's still worth getting. (A second edition, which I have yet to see, is now out.)

Don't expect one book to cover *everything*—and don't expect to become the compleat Zen master of the Internet in a week.

Two new books, *The Internet Business Guide: Riding the Information Superhighway to Profit* by Rosalind Resnick and Dave Taylor (Sams Publishing) and *The Internet Business Book* by Jill Ellsworth and Matthew Ellsworth (John Wiley & Sons Inc.), will soon be joined by more Internet business books in the pipeline from publishers such as Addison-Wesley, McGraw-Hill, O'Reilly and Prentice Hall. These range from technical tomes to case histories, and some will probe more-technical aspects such as using Mosaic and creating "Internet storefronts" for business purposes. Look for those that reflect direct Internet business experience.

Platform-specific guides. These are, as the category indicates, specific to a given platform/operating system. Although you may provision your network with tools very different from what's recommended in these books, which are mostly for single-account end users, by definition they'll look at platform specifics in more detail than any general-user reference can.

Michael Fraase's *Internet Tour Guide* is available from Ventana Publishing in Windows, Macintosh and DOS versions. Macintosh users will also want Adam Engst's *The Internet Starter Kit for Macintosh* (Hayden Books).

Supplementary user/manager books. These are topic- and issue-oriented books, designed to supplement the more tool/task-oriented user guides.

Kevin Savetz's *Your Internet Consultant: The FAQs of Life Online* (Sams Publishing) takes a Q&A approach to understanding the Internet, which makes it a book you can browse through in odd moments as well as read through steadily.

The Internet Unleashed by Steve Bang, Martin Moore, Rick Gates, et al., (Sams Publishing) weighs in at 1,300-plus pages, the current heavyweight champion. This anthology of articles from several dozen contributors contains excellent information on everything from business policies to setting up servers and security.

Internet directories and catalogs. This category is the most controversial, since a printed list of Internet resources is out of date before the ink dries and it seems counterintuitive to use a book to identify Internet resources.

On the other hand, the Internet doesn't yet have online indexes and directories that are comprehensive, ubiquitous and easy to use—and your users may not have ready access to Internet "thing-finding" services. Also, it's often easier to use a book, especially if it is well-indexed.

Two popular directories/catalogs are *The Complete Internet Directory* by Eric Braun (Fawcett Columbine) and *Internet: Mailing Lists* by Edward T. Hardie and Vivian Neou (Prentice Hall). An outgrowth of the original Stanford Research Institute "list of lists," the Hardie and Neou book summarizes information about thousands of the Internet's topical discussion lists; with a keyword-intensive index, it's a surprisingly valuable tool.

You might also want discipline-specific resource books (legal, library); these may go into greater depth than online resources.

I don't recommend books that are simply long, no-value-added printouts of lists readily available from the Net (for example, in Usenet *news.answers* and *news.lists*). Not casually recommended: any "Yellow Pages" effort. These are generally incomplete and inadequately indexed. Definitely not recommended: any "White Pages" of individual E-mail addresses. Also, be careful: Some directories have used old, even inaccurate source material—another good reason to work from online resources whenever possible.

For systems and network administrators and policy planners. These books will help you evaluate Internet connectivity providers and understand what's involved in provisioning and integrating connections between the Internet and your company's LANs and computers.

At minimum, you should have copies of *The Internet Connection: System Connectivity and Configuration* by John S. Quarterman and Smoot Carl-Mitchell (Addison-Wesley) and Susan Estrada's *Connecting to the Internet* (O'Reilly). The first is more technical and comprehensive, but it's worth having both.

You'll also want a handful of books on Internet-related systems and network administration and security. If your organization is running Unix systems and/or TCP/IP networks, you probably already have some of these books on hand. Worth getting: *Firewalls and Internet Security* by William R. Cheswick and Steven M. Bellovin (Addison-Wesley); *Practical Unix Security* by Simson Garfinkel and Gene Spafford (O'Reilly); *TCP/IP Illustrated, Volume 1, The Protocols* by W. Richard Stevens (Addison-Wesley); *TCP/IP Network Administration* by Craig Hunt (O'Reilly); *Novell's Guide to Integrating Unix and NetWare Networks* by James Gaskin (Sybex); *Internetworking with TCP/IP* by Douglas Comer (Prentice Hall); and *The Matrix: Computer Networks and Conferencing Systems Worldwide* by John S. Quarterman (Prentice Hall). In addition, *!%@:: A Directory of Electronic Mail Addressing and Networks* by Donnalyn Frey and Rick Adams (O'Reilly) is an invaluable reference.

Depending on what Internet services you're using, your technical/operations group may also want books on installing and administering UUCP/Usenet, Mosaic, Gopher, World Wide Web, etc. There are also technical and reference books on network protocols, Unix, TCP/IP and other topics.

For trainers and corporate librarians. These books are for the people in charge of acting as "Internet intermediaries" and training end users. *Crossing the Internet Threshold: An Instructional Handbook* by Roy Tennant, John Ober and Anne G. Lipow (Library Solutions Institute) was very well received; there's also a supplement, *Introducing the Internet: A Trainer's Workshop: Internet Workshop Series Number 1* by Lee Jaffe (Library Solutions Institute). Also recommended is *The Internet and Special Librarians: Use, Training and the Future* by Sharyn J. Ladner and Hope N. Tillman (Special Libraries Association).

> **Be suspicious of secondary sources for Internet information. Many books contain numerous, often surprising errors.**

There are several other general-interest and reference books you might find valuable. For a definitive anthology of network/computer-security problems, incidents and issues, get *Computers Under Attack: Intruders, Worms, and Viruses* edited by Peter Denning (ACM Press/Addison-Wesley). For a readable introduction to the Internet, its inhabitants and culture, try *The Cuckoo's Egg: Inside the World of Computer Espionage* by Clifford Stoll (Doubleday); it's also a true-life technothriller. To make sense of the Internet jargon you'll run into, get a copy of *The New Hacker's Dictionary* compiled by Eric Raymond (MIT Press)—the essential compendium of technical and cultural jargon of the Internet, Unix and Usenet communities (it's also a fun browse). And for a brief guide to acceptable online behavior, get *Netiquette* by Virginia Shea (Albion Books).

Where to find more. The sheer quantity of Internet books means that few general bookstores can stock all of them. Bookstores like the California-based chain Computer Literacy Bookshops (408 435-5017 or *info@clbooks.com*) and Quantum Books in Cambridge, Mass. (617 494-5042 or *quanbook@world.std.com*), and mail-order bookstores such as Cucumber Information Services (800 223-8649 or *info@cucumber.com*) are making efforts to be comprehensive—consider getting their newsletters.

If you have access to the Internet (a single-user personal account will do), you can keep track of what's available by periodically reading Kevin Savetz's Unofficial Internet Books FAQ, posted twice a month to Usenet newsgroups including *alt.internet.services* and *news.answers* (also available by File Transfer Protocol and E-mail from the *rtfm.mit.edu* archives). Another Internet book list is maintained by Hope Tillman in the Babson College Gopher (*babson.edu*).

Internet-oriented publishers and bookstores are increasingly offering catalog, summary and purchasing information via the Internet, on Gopher and World Wide Web servers (for example, *enews.com*, *ora.com*, *aw.com*, *ph.com*). Reviews of new books also are posted to newsgroups and mailing lists, such as *nettrain*.

Now all you need is another bookshelf.

Daniel P. Dern, based in Newton Centre, Mass., ddern@world.std.com*, has been using as well as writing and speaking about the Internet for a decade. The founding editor of* Internet World *magazine, he is the author of* The Internet Guide for New Users *(McGraw-Hill, 1994) and* The Internet Business Handbook *(forthcoming from Prentice Hall).*

CIO

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In the Beginning...

BY ANNE STUART

IMP installation team, 1970

In October 1969, researchers Ben Barker and Marty Thrope exchanged the world's first electronic messages—between a computer room at UCLA and the Stanford Research Institute 350 miles north in Menlo Park, Calif. The transmission represented an early salvo in a communications revolution. Yet the milestone passed so quietly that, today, nobody remembers what the messages said.

"It wasn't like, 'One small step' or 'What hath God wrought?' " recalls Barker, then a hardware engineer fresh out of Harvard and now senior vice president and chief technology officer for Bolt Beranek and Newman Inc. of Cambridge, Mass. "This was just a little experiment some of us were working on."

Their "little experiment" evolved into today's Internet, the vast computer network that millions worldwide use to swap messages, hold conferences, conduct research, retrieve files and—increasingly—make deals, transact business and create spinoff industries. And it's still growing astronomically: from 100,000 computer hosts in 1989 to more than 3 million today.

Even the low end of that tally exceeds the wildest expectations of many members of the scientific "dream team" commissioned 25 years ago to link computers at four western research sites. Sponsored by the U.S. Department of Defense's Advanced Research Projects Agency, the project was called ARPANET. While ARPANET's creators recognized the network's value as a tool for scientific collaboration, most didn't foresee it mushrooming into a mainstream way of life—and an almost limitless way of doing business.

"It was clearly a complete change from anything that had been done before," Barker says. "But as for leading to this"—a global network connecting more than 30 million users—"nobody had any idea."

Today, even schoolchildren take for granted the easy transfer of information between computers. But before ARPANET, it was cumbersome, involving the physical movement of batches of magnetic tapes or punch cards, usually from one isolated machine to another.

Researchers figured there had to be a better way. They found it in packet switching. That technique involves breaking information into small blocks, sending it over the network, routing it to its destination and reassembling it. The technology allows packets from many sources to speed simultaneously along the same lines; they can be rerouted to avoid congestion.

On Sept. 2, 1969, researchers in a UCLA lab sent the first few bits of data to a computer from a refrigerator-sized packet switcher known as an interface message processor (IMP). A month later, after a second IMP was installed in Menlo Park, Barker and Thrope swapped messages. By year's end, more IMPs added UC Santa Barbara and the University of Utah to the network.

The team's efforts attracted little attention in the outside world; Woodstock, the Vietnam War and the Apollo 11 moon landing monopolized the headlines that year. But its work excited the scientific community because of its potential for eliminating geography as a factor in collaboration. "It no longer mattered whether the person you were working with was in the next office or the other side of the country," Barker recalls.

By 1971, ARPANET linked about two dozen research sites, including several on the East Coast. By 1984, there were 1,000 computer hosts worldwide; by 1989, when ARPANET officially metamorphosed into the Internet, there were 100,000. By 1991, there were 1 million—a figure that tripled this year as retailers, publishers, service providers and others scrambled to make old businesses electronic and explore new ventures online.

This fall, about a dozen ARPANET pioneers gathered in Boston for a 25th anniversary celebration. While some, like Barker, never anticipated the current popularity of the creation, others wonder what took so long. "Many of us would have predicted in 1969 that it would take five or 10 years to get to the point where we are now," says Robert Taylor, then the head of ARPA's computer research program and now director of the Digital Equipment Corp. Systems Research Center in Palo Alto, Calif.

A few fret about the future. Severo Ornstein, an ARPANET hardware engineer who later founded Computer Professionals for Social Responsibility, worries that "what was once our little pride and joy will be taken over by commercial institutions which will have little interest in or sympathy for the kind of interpersonal and intergroup communication that has thus far dominated visible network usage." But Ornstein also believes the Internet could become a tool for public good by allowing direct political participation.

Meanwhile, those who started the Internet story say they're waiting as breathlessly as everyone else for the next chapter. "I feel like we're all living in the middle of an Agatha Christie novel," says Vinton Cerf, the TCP/IP protocol developer who is now senior vice president of data architecture at MCI Communications Corp. "I can hardly wait to find out what the next killer app will be." CIO

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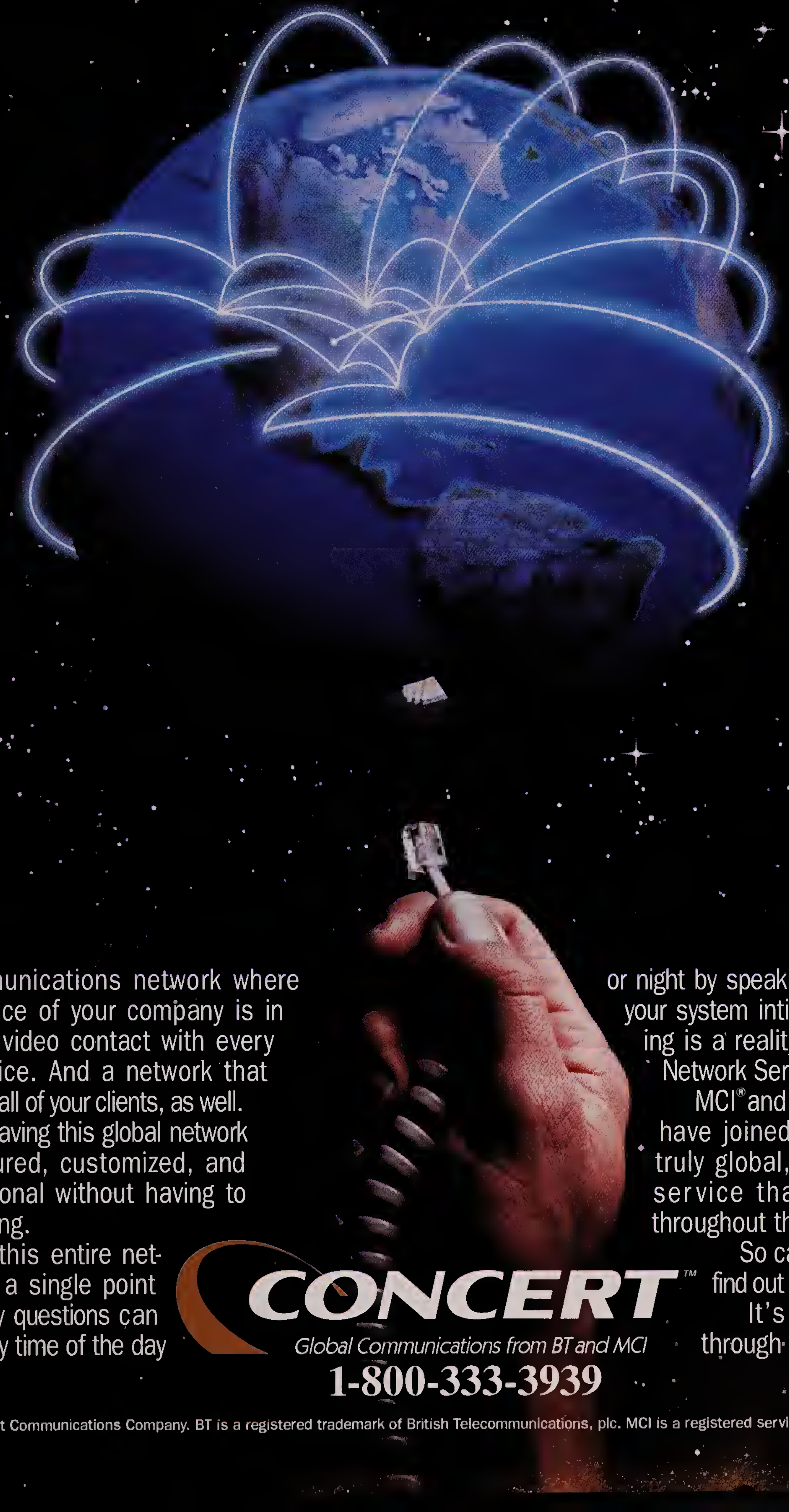

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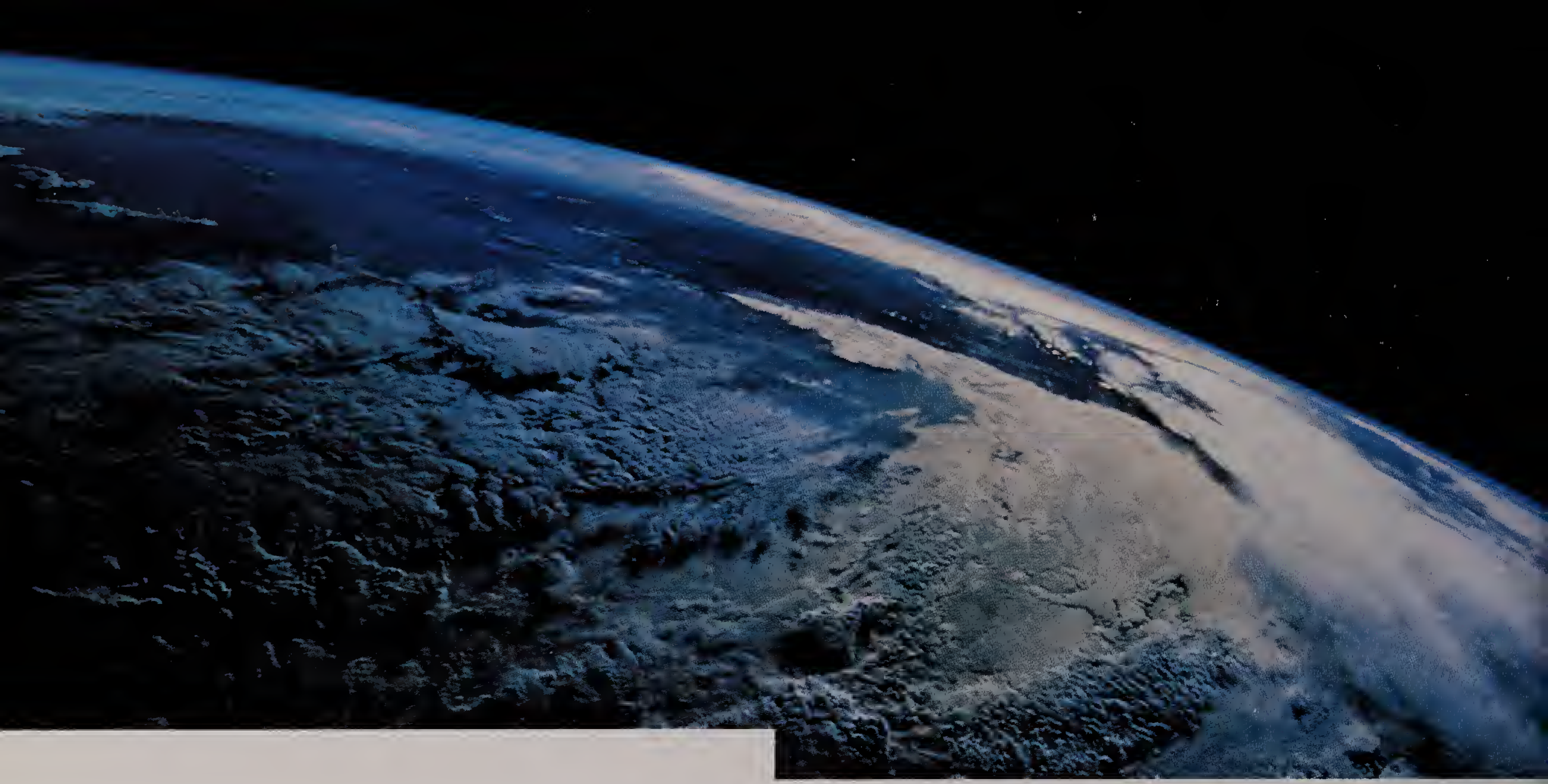

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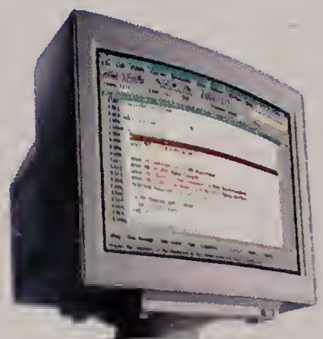

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